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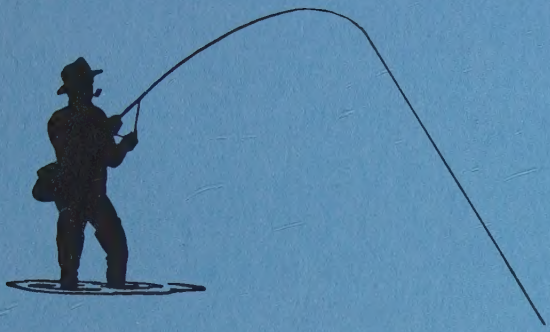

SPORT FISHERY ABSTRACTS

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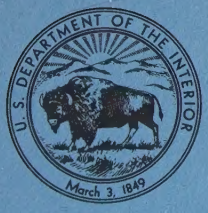

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SPORT FISHERY ABSTRACTS

An abstracting service for fishery research and management

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Sport Fishery Abstracts is intended to furnish fishery biologists in government agencies and educational institutions with abstracts of the current literature in sport fishery research and management. Abstracts of published articles on limnology, ecology, natural history and other fields of specialization are included when the subject has application to the conservation and management of sport fishery resources.

One volume consisting of four numbers is issued each year. Each number contains separate Author and Subject indexes. The final number of each volume contains cumulative Author and Subject indexes and a list of publications screened.

Suggestions for improving the usefulness and scope of Sport Fishery Abstracts are solicited.

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18437. Barica, Jan (Dept. of the Environ., Fish. and Mar. Serv., Freshwater Inst., Winnipeg, Manitoba R3T 2N6, Canada). 1974. EXTREME FLUCTUATIONS IN WATER QUALITY OF EUTROPHIC FISH KILL LAKES: EFFECT OF SEDIMENT MIXING. Water Research, 8(11): 881-888.

Variations in nutrient content and dissolved oxygen concentrations in two shallow winterkill pothole lakes are described. The chemical systems of these lakes are displaced from a steady state during anoxic conditions under ice cover in winter or after a sudden collapse of algal blooms and their bacterial decomposition in summer. Due to their reductive character and high content of soluble nutrients, lake sediments play an important role in formation of water quality of these lakes. In contact with overlying water when upwelled by wind action or artificial aeration, they cause a significant depletion of dissolved oxygen and a release of ammonia into water column. (Auth.)

18438. Koirtyohann, S. R., Richard Meers, and L. K. Graham (Environ. Trace Substances Center and Dept. of Agric. Chem., Univ. of Missouri, Columbia, Mo. 65201). 1974. MERCURY LEVELS IN FISHES FROM SOME MISSOURI LAKES WITH AND WITHOUT KNOWN MERCURY POLLUTION. Environmental Research, 8(1): 1-11.

Mercurial fungicides used in golf greens maintenance can lead to elevated levels of mercury in fish, from lakes receiving greens drainage. Of the species tested, the largemouth bass was the most sensitive indicator with levels ranging from 1 to 7 μg Hg/g of wet tissue in fish taken from lakes which receive drainage from treated greens. Background mercury levels in largemouth bass from impoundments in central Missouri are 0.1-1.2 ppm depending on size and other factors. Many lakes with no known source of mercury contamination produce bass which contain significantly more than 0.5 ppm of mercury. (Authors)

18439. Kabata, Z. (Dept. of the Environ., Fish and Mar. Serv., Pacific Biol. Station, Nanaimo, British Columbia V9R 5K6, Canada). 1974. MOUTH AND MODE OF FEEDING OF CALIGIDAE (COPEPODA), PARASITES OF FISHES, AS DETERMINED BY LIGHT AND SCANNING ELECTRON MICROSCOPY. J. Fish. Res. Board Can., 31(10): 1583-1588.

The structure of the caligid mouth tube is examined by light and scanning electron microscopy in examples of Caligus curtus, C. clemensi, and Lepeophtheirus salmonis. Special attention is directed to the intrinsic musculature of the labrum. A new masticatory apparatus is described, consisting of a divided dentiferous bar at the tip of the labium and referred to as a strigil. A new concept of the mode of feeding is presented. The tissues of the fish are scraped off by movements of the strigil and the debris is then picked up by the mandibles which initiate its passage into the buccal cavity. Its transport is assisted by contractions of labral musculature, capable of creating a propelling, peristaltic wave. (Auth.)

18440. Crawford, David L., Duncan K. Law, Thomas B. McKee, and John W. Westgate (Dept. of Food Sci. and Technology, Seafoods Lab., Oregon State Univ., Astoria, Oregon 97103). 1974. NUTRITIONAL CHARACTERISTICS OF OREGON PELLET RATIONS CONTAINING MEALS OF DIFFERENT FISH SPECIES. Prog. Fish-Cult., 36(1): 3-7.

The nutritional effect of replacing herring meal in Oregon pellet rations on the growth response of spring chinook salmon (Oncorhynchus tshawytscha) was evaluated. Replacements included meals of Pacific hake, menhaden, and anchoveta. Pepsin indigestible protein and available ϵ-amino lysine contents and protein efficiency ratios for the meals were correlated with salmon growth response. It was found that a variety of industrially available meals of different fish species can be used to replace herring meal in Oregon pellet rations with the assurance of adequate growth. Factorial analysis showed no significant interaction between meal species and meal sample for weight gain. Optimum and consistent growth similar to that observed in the past for ration meals are derived. Achieving optimum conversions and consequently lower production costs would require not only specifications based upon species but also on protein quality. (Authors)

18441. Deufel, J. (Institut f. Seenforsch. and Seenbewirtschaft, Langenargen, Germany). 1974. PROPHYLACTIC MEASURES AGAINST BACTERIAL DISEASES OF SALMONID FRY (Prophylaktische Massnahmen gegen bakterielle Erkrankungen der Salmonidenbrut). Osterreichs Fischerei, 27(1): 1-5; Fish Health News, 3(4): p. 7.

Bacterial gill disease is common in fish hatcheries producing salmonids, esocids and other fishes. Recommended treatment is a chemical sold under the trade name of MEFAROL which seems to be identical, or similar, to 10% ROCCAL in America. It is used in the same manner as ROCCAL for treatment and prophylaxis. This product is used as is in concentration of 20 ppm for one hour. Nifurprazine is recommended for treatment of furunculosis and sold under the name of CAROFUR. It is a water soluble product which can be added to water or food. Dosage is as follows: In water in raceways with water stopped - 5-10 ppm for one hour with aeration; in circular pools with flowing water - 15-20 ppm; with food for treatment - 0.5-1.0g per kg of food for 4-6 days; with food for prophylaxis - 0.01-0.5g per kg of food for 3-4 days, repeated every three weeks. Toxic effects of the drug may show up 8 days post treatment. -- S. F. Snieszko

18442. Weber, Don T., and Richard L. Imier. 1974. AN EVALUATION OF ARTIFICIAL SPAWNING BEDS FOR WALLEYE. Special Report No. 34, Colorado Div. of Wildlife, Fish. Res. Section, State Publication Code W-R-S 34, price $1.00, 17 p., illus.

Two 5,000-square-foot rock spawning beds for walleye, Stizostedion vitreum vitreum (Mitchill), were installed in 502-acre Lonetree Reservoir, Colorado in the fall of 1971. Estimates of spawning adults and young-of-the-year (Y-O-Y) walleye populations as well as measurements of environmental factors were compared before (1969-1971) and after (1972-1973) the spawning beds were installed. Adult walleye population estimates ranged from 275 to 681 fish but did not change significantly during the study. No significant differences in the growth of adult fish between years were found. Relative strength of year-classes for the period 1960-1971, as determined by a mean ranking method, showed that the strong year-classes appeared every 4 or 5 years. Y-O-Y walleye population estimates ranged from 493 in 1970 to 1,057 in 1972 to 5,499 in 1973. Y-O-Y population estimates and numbers of Y-O-Y captured per minute of electrofishing were greater after the spawning beds were installed. The average annual survival rate of adult walleye was estimated to be 0.63-0.67. A minimal fisherman exploitation rate of 0.13 was determined from voluntary returns of tagged fish in 1973. No significant correlations were found between adult population estimates and Y-O-Y population estimates. The environmental factors, mean gauge height from January to October, and April air temperatures and degree days, were significantly correlated with the relative strength of the 1960-1971 year-classes. None of the measured environmental factors were related to increases in Y-O-Y populations that occurred after the spawning beds were installed. The increase in number of Y-O-Y walleye is attributed to the spawning beds. (Authors)

18443. Buchanan, Johnny P., and Horace E. Bryant (Tenn. Valley Auth., Forestry, Fish., and Wildl. Development, Muscle Shoals, Alabama). 1973. THE OCCURRENCE OF A PREDORSAL STRIPE IN THE BLACK CRAPPIE, Pomoxis nigromaculatus. J. Ala. Acad. Sci., 44(4): 293-297, illus.

A black predorsal stripe was found on 28.1% of 2192 black crappie, Pomoxis nigromaculatus, examined from Beaver Reservoir in Arkansas. Investigation revealed the character to exist in black crappie from at least thirteen states. (Authors)

18444. Bengtsson, Bengt-Erik (Univ. of Umeå, Dept. of Biol., Section of Ecol. Zool., S-901 87 Umeå, Sweden). 1974. EFFECT OF ZINC ON THE MOVEMENT PATTERN OF THE MINNOW, Phoxinus phoxinus L. Water Research, 8(10): 829-833.

A shoal of 30 minnows, Phoxinus phoxinus L., developed hyperactivity as a response to a gradually increased zinc concentration. This behaviour was followed by a period when the fish displayed hypoactivity. Besides the quantitative alterations in activity there were also changes in the distribution between diurnal and nocturnal activity. (Auth.)

18445. Jensen, Albert C. 1974. SPORT FISHERIES AND OFFSHORE OIL. N. Y. Fish and Game Journal, 21(2):105-116.

The possibility of exploratory and production drilling for petroleum on the Continental Shelf off the Northeast Coast of the United States has aroused the concern of sportfishermen from New York and neighboring states. This paper discusses the marine sportfishery resources in the area in relation to the suspected petroleum reserves. (Auth.)

18446. Paloheimo, J. E., and P. F. Elson (Dept. of Zool. and The Inst. of Applied Statistics, Univ. of Toronto, Toronto, Ontario, Canada). 1974. REDUCTION OF ATLANTIC SALMON (Salmo salar) CATCHES IN CANADA ATTRIBUTED TO THE GREENLAND FISHERY. J. Fish. Res. Board Can., 31(9): 1467-1480.

Recaptures of Atlantic salmon (Salmo salar) tagged as smolts show that substantial numbers of those produced in the Maritimes are caught in Greenland waters. Percentage recoveries in the home-river system show a significant inverse correlation with levels of catches in Greenland. Analyses of detailed data collected since 1950 indicate that the Greenland fishery has caused serious reduction of Miramichi stocks of 2-sea-winter salmon and will affect the future long-term production of Atlantic salmon in Canada. Total landings have risen higher per million smolts produced in the Miramichi system since the Greenland fishery began. The escapement from fisheries and the potential spawning stock per given numbers of smolts has dropped correspondingly. Lowered escapement has been followed by lowered abundance of progeny as reflected by density of young in nursery stream areas. Significantly, recruitment as measured in numbers of underyearlings depends more crucially on numbers of salmon escaping the fishery than on numbers of grilse. As shown by this statistical analysis, the Greenland fishery has had a direct adverse effect on the numbers of salmon surviving to enter their spawning river. Consequently, the abundant smolt runs in 1964, 1965, and 1968 produced by good escapement some 4 yr earlier failed to maintain adequate levels of recruitment and have instead been followed by all-time low commercial catches and recruitment of young in rivers. (Authors)

18447. Martin, Catherine C. (Dept. of Nat. Res. & Environ. Control, Div. of Fish & Wildlife, Dover, Delaware). 1974. DELAWARE'S TIDAL STREAMS 1974. Dept. of Nat. Res. & Environ. Control, Div. of Fish & Wildl., Dover, Delaware, 30 p., illus.

With increasing public interest in Delaware's tidal wetlands, the Division of Fish and Wildlife within the Department of Natural Resources and Environmental Control realized the necessity for an up-to-date inventory of the aquatic life in tidal tributaries. These streams are nursery areas and potential sport fishing areas for many of the estuarine and marine game fish found in the Delaware River and Bay and the Atlantic Ocean. The tributaries or tidal streams of an estuary are more biologically productive than either freshwater ponds or the open ocean. Sport fishes in these streams are numerous but are not utilized to any large extent. The potential is here for some fantastic fishing which requires none of the expensive and sophisticated equipment of the open water fishermen. The variety of game fish in these streams provides a relaxed type fishing during days when the weather denies the fishermen access to the bay and ocean. Thirteen tidal tributaries to the Delaware River and Bay were studied from Reybold Creek in Delaware City to the Broadkill River in Lewes. In addition, Broad Creek, a major tributary to the Nanticoke River was studied. Indian River, Rehoboth and Little Assawoman Bays each had three tidal tributaries studied to bring the total to 23. (Auth.'s introduction)

18448. Konovalov, Yu. D., and A. Ya. Mestechkina (Inst. of Hydrobiol., Ukrainian Acad. of Sci., SSR, Kiev, USSR). 1973. DYNAMICS OF THE CONTENT OF SULFHYDRYL AND DISULFIDE GROUPS IN PROTEIN AND NONPROTEIN COMPOUNDS DURING THE EARLY ONTOGENESIS OF THE CARP. Hydrobiological Journal, 9(3): 30-36.

The content of thiol group in protein increases during the development of the egg of the carp from the small-cell morula stage. Rapid hydration of the egg begins after its fertilization. (Authors)

18449. Stevens, E. D., and F. E. J. Fry (Dept. of Zool., Univ. of Hawaii, Honolulu, Hawaii 96822). 1974. HEAT TRANSFER AND BODY TEMPERATURES IN NON-THERMOREGULATORY TELEOSTS. Can. J. Zool., 52(9): 1137-1143.

Coefficients of temperature change in relation to body size are given for three species of fish native in Lake Huron, subjected to a sudden drop in ambient temperature of about 5 C. These observations together with published data provide cooling coefficients for fish and aquatic reptiles over a weight range of 1-5000 g. The slope of the regression-log cooling coefficient on log body weight is about -0.6. The hypothesis offered is that the magnitude of the slope in question results from the temperature measured being close to the center of a body of constant thermal conductivity, retaining essentially the same proportions throughout growth. In addition, various observations of excess deep-body temperatures were collected in relation to weight for poikilothermal fish and aquatic reptiles, all presumed to be in thermal equilibrium with their environment. A double logarithmic plot of deep body temperature on weight in this case has a slope of about 0.4. The relation between these two slopes appears to be satisfactorily explained by the general observation that the slope of a double logarithmic plot of metabolic rate per unit weight on body weight has a slope of about -0.2. (Authors)

18450. Ihssen, P., and J. S. Tait (Ont. Min. of Nat. Res., Fish and Wildl. Res. Branch, Maple, Ontario, Canada). 1974. GENETIC DIFFERENCES IN RETENTION OF SWIMBLADDER GAS BETWEEN TWO POPULATIONS OF LAKE TROUT (Salvelinus namaycush). J. Fish. Res. Board Can., 31(8): 1351-1354.

Lake trout (Salvelinus namaycush) derived from two populations differed in retention of swimbladder gas. The two reciprocal interpopulation crosses were intermediate to the parent populations. The two F_1 hybrids obtained by crossing fish from each lake trout population with brook trout (S. fontinalis) were also found different in retention. Gas retention was correlated with depth distribution of the parent populations, high retention being associated with deeper distribution. (Authors)

18451. Douglas, Vaughn M., and Robert T. Lackey (Dept. of Fish. & Wildl. Sci., Virginia Polytechnic Inst. and State Univ., Blacksburg, Virginia 24061). 1974. EXPERIMENTAL CAGE CULTURE OF CHANNEL CATFISH STRAINS IN VIRGINIA. Va. J. Sci., 25(3): 141-146.

Three strains of channel catfish, Ictalurus punctatus (Rafinesque), from the southeastern United States were cultured in cages to select a strain that would attain marketable size during the relatively short Virginia growing season. Strains were compared in terms of yield, survival, mean weight, food conversion, coefficient of condition, and percent marketable fish. Statistical analysis indicated that the Kansas strain was significantly different from both the Arkansas and North Carolina strains, but the latter two were not significantly different with respect to yield, mean weight, food conversion, and percent marketable fish. Financial analysis, conducted to evaluate feasibility of culturing channel catfish in cages moored in small farm ponds, showed that catfish would have to be sold for more than $.610 per kg ($.277/lb.) to make the operation profitable. Cage culture of channel catfish is possible in Virginia, but is not generally recommended for small farm ponds unless extensive preliminary test culture is undertaken at the proposed site. (Authors)

18452. Birger, T. I., A. Ya. Malyarevskaya, and O. M. Arsan (Inst. of Hydrobiol., Ukrainian Acad. of Sci., Kiev, USSR). 1973. ETIOLOGY OF THE HAFF (YUKSOV-SARTLAN) DISEASE. Hydrobiological Journal, 9(2): 71-80.

Haff disease is a specific disease affecting man and animals that regularly consume toxic fish in large quantities. The fish viscera (intestines, liver, mature eggs) and fat are 10 or 11 times more toxic than the meat, an indication that the toxic principle is related to the lipid fraction. Fish apparently become contaminated during blooms of blue-green algae. Animals that consume such fish undergo B_1 avitaminosis, which may be severe, leading to death, or mild, producing functional gastrointestinal disorders and, at times, allergies.

18453. Cairns, John, Jr., John W. Hall, Eric L. Morgan, Richard E. Sparks, William T. Waller, and Garson F. Westlake (Biol. Dept. and Center for Environ. Studies, Va. Polytechnic Inst. and State Univ., Blacksburg, Virginia 24061). 1974. THE DEVELOPMENT OF AN AUTOMATED BIOLOGICAL MONITORING SYSTEM FOR WATER QUALITY MANAGEMENT. Reprint from Trace Substances in Environmental Health-VII. A symposium, D. D. Hemphill, Ed., Univ. of Missouri, Columbia, Mo., pp. 43-53.

The time has come to go beyond merely responding to one environmental crisis after another and to manage all ecosystems on a regional basis. Control measures applied to aquatic ecosystems in the absence of information on the condition of the system are apt to be inappropriate. They may over-protect the receiving system at times and under-protect it at other times since the ability of ecosystems to receive wastes is not constant. A major determinant of the effectiveness and efficiency of ecological quality control is the lag time in the feedback of information. Present techniques for measuring the responses of aquatic organisms and communities require days or weeks, whereas information for ecosystem quality control and prevention of ecological crises should be generated in minutes or hours as is the case for other quality control systems. A biological monitoring system has been developed to generate information rapidly. The system measures changes in the movement and breathing of fish in order to provide an early warning of developing toxicity in the wastes of an industrial plant. The method of automation of data collection from this system and its development into an "on-line" system for monitoring water quality is described. Experiments with the system have already indicated that it is able to detect low concentrations of zinc and other toxicants and that responses are sufficiently rapid to make the system useful for water quality management. (Authors)

18454. Hanamoto, Eiji (Kanagawa Prefectural Fisheries Exp. Sta., Jogashima, Miura-city, Kanagawa-pref., Japan). 1974. FISHERY-OCEANOGRAPHIC STUDIES OF STRIPED MARLIN, Tetrapturus audax, IN WATERS OF BAJA CALIFORNIA. I. FISHING CONDITIONS IN RELATION TO THE THERMOCLINE. NOAA Tech. Report NMFS SSRF-675, pp. 302-308.

In this report, the author analyzed fishing conditions for striped marlin in waters off Baja California in relation to the thermocline. The results were as follows: 1. In subarea SW, bounded by lat. 15°-25°N and long. 115°-110°W, catch rates begin increasing from about May and reach a peak between July and October. In subarea SE, bounded by lat. 15°-25°N and long. 110°-105°W, there appears to be a tendency for catch rates to be highest from July through October. In subarea M, bounded by lat. 10°N to along the coast of Mexico and long. 105°-95°W, catch rates are highest between May and July. 2. From December through March there is good fishing in relatively narrow areas around the tip of Baja California. In April, a good fishing ground appears off Manzanillo and in May this ground begins to expand seaward. From June, the area of good fishing off the coast from Acapulco to Mazatlan begins to expand seaward and the greatest expansion of grounds occurs off Baja California in September. In October, the ground becomes narrow and is located farther east. 3. The pattern of expansion and contraction of the shallow thermocline area coincides fairly closely with the pattern of expansion and contraction of good fishing grounds. One of the factors related to this phenomenon is that the formation of good fishing grounds off Baja California is considered to be related to the shallow thermocline areas where there is a more abundant food supply. (Auth.)

18455. Zitko, V. (Dept. of the Environ., Biol. Sta., St. Andrews, New Brunswick, E0G 2X0, Canada). 1974. UPTAKE OF CHLORINATED PARAFFINS AND PCB FROM SUSPENDED SOLIDS AND FOOD BY JUVENILE ATLANTIC SALMON. Bull. Environ. Contamin. Toxicol., 12(4): 406-412.

In contrast to PCB, chlorinated paraffins are much less, if at all, accumulated by juvenile Atlantic salmon when the fish are exposed to chlorinated paraffins adsorbed on silica or fed contaminated food. Chlorinated paraffins at 10 and 100 μg/g in food are very likely toxic to juvenile Atlantic salmon, but additional experiments are required to confirm this conclusion. (Auth.'s conclusion)

18456. Vladimirov, V. I. (Inst. of Hydrobiol., Ukrainian Acad. of Sciences, Kiev, USSR). 1973. THE EFFECT OF GROWTH RATE OF SPAWNERS ON THE SURVIVAL AND ABUNDANCE OF THE PROGENY. J. Ichthyol., 13(6): 801-812.

The importance of changes in the different qualitative indicators of mature eggs as changes occur in the growth and fecundity of females for an evaluation of the viability of the progeny is revealed on the basis of an evaluation of published data and the author's own data; the viability of fishes in the early stages of life and the abundance of the progeny are considered as a function of the growth rate of the spawners (as one indicator of their quality); the interrelationship between the growth rate of spawners and the survival and abundance of the progeny is an important constituent of the mechanism of the natural regulation of abundance in those populations in which the feeding of spawners is limited by feeding conditions.

18457. Reynolds, William W., and Donald A. Thomson (Biol. Dept., The Penn. State Univ., Wilkes-Barre Campus, P. O. Box 1830, Wilkes-Barre, Pennsylvania 18708). 1974. RESPONSES OF YOUNG GULF GRUNION, Leuresthes sardina, TO GRADIENTS OF TEMPERATURE, LIGHT, TURBULENCE AND OXYGEN. Copeia No. 3, pp. 747-758.

Young Gulf of California grunion, between 25 and 160 days posthatching, exhibited a modal temperature preferendum of 32 C. Prior to 3 weeks of age, they showed no clear temperature preference. At all ages from hatching through at least 150 days, the fish were strongly photo-positive, selecting the brightest available light intensity (32000 lux). They also preferred a moderated level of turbulence, and tended to avoid oxygen concentrations below 5 ppm, as well as unnaturally high dissolved oxygen concentrations. These laboratory responses are consistent with the known distribution of juvenile Gulf of California grunion in the warm, shallow inshore waters of the Gulf, and may provide a mechanism by which they seek, and remain in, a favorable environment. (Authors)

18458. Bond, W. A. (Fish. Mgmt Div., Resource Mgmt Branch, Dept. of the Environ., Winnipeg, Manitoba, Canada). 1974. THE GREAT SLAVE LAKE COMMERCIAL FISHERY, SUMMER, 1973. Tech. Report Series No. CEN/T-74-8, Environ. Canada, Resource Mgmt Branch, pp. 1-38.

During summer, 1973, studies were conducted as part of a long range program designed to gather that information considered essential to the proper management of the Great Slave Lake commercial fishery. Monitoring of the commercial landings at four lake locations resulted in the measurement and weighing of 7,470 whitefish. Age determinations were made on 3,061 of these fish. The mean age of commercial whitefish was 9.6 with age groups 8 - 11 inclusive contributing 76% of the total. Mean weight varied from 2.3 pounds to 2.8 pounds according to sampling site. The total annual mortality rate, based on half-monthly samples varied from 0.46 to 0.79. Commercial catch data gathered during 1972 and 1973 showed whitefish comprising 37% of the total catch in terms of numbers. The overall catch per unit of effort for whitefish was 26 pounds per net. An estimated 10% of all whitefish caught were culled by the fishermen. The commercial fishing fleet consisted of 18 fish boats and 56 skiffs operated by 128 fishermen. The total effort expended by the fishery was approximately 74,000 nets. The summer fishery began during the first week of June and finished October 21. (Auth.)

18459. Courtenay, Walter R., Jr., Harry F. Sahlman, Woodard W. Miley, II, and David J. Herrema (Dept. of Biol. Sci., Florida Atlantic Univ., Boca Raton, Florida 33432). 1974. EXOTIC FISHES IN FRESH AND BRACKISH WATERS OF FLORIDA. Biological Conservation, 6(4): 292-302.

At least 38 species and several hybrids of exotic fishes have been found in fresh and brackish waters of Florida. Twenty species and five hybrids are at present established in the form of reproducing populations. The ornamental aquarium fish industry has been the major source of these introductions. Several methods of introductions are considered and recommendations presented toward preventing repetitions in the future. Future dispersal of exotics by channelization projects should become part of environmental impact statements. (Authors)

18460. Snow, Howard E. 1974. EFFECTS OF STOCKING NORTHERN PIKE IN MURPHY FLOWAGE. Tech. Bull. No. 79, Wisconsin Dept. of Natural Resources, Box 450, Madison, Wisconsin 53701, 20 p.

Monitoring of fish populations in Murphy Flowage, a 180-acre flowage in northwestern Wisconsin, between 1955 and 1960 indicated the development of an overabundant, slow-growing population of bluegills (Lepomis macrochirus). In 1960 and 1961, attempts to improve bluegill growth by mechanical thinning failed apparently because only the larger bluegills were removed. Since the flowage already had a good northern pike population (Esox lucius), it was suggested that increasing this predator population might result in controlling of bluegill numbers and hence, improving growth. To test this hypothesis, the flowage was stocked in late December, 1963, with 8,534 northern pike fingerlings ranging in size from 10.4 to 22.8 inches in total length. On an area basis, this stocking was equal to 47 fish/acre or 40.3 lbs/acre which met the intent of approximately doubling the northern pike population in the flowage. Complete angling records were obtained by a compulsory permit system throughout the entire study from 30 April 1955 through 31 May 1970. Population density of stocked northern pike declined drastically following stocking from 47.0 pike or 40.3 lbs/acre in 1963 to 0.2 pike or 0.6 lbs/acre by 1968. By the spring of 1966, the stocked and native northern pike population was at its lowest level since 1960. In addition, the number of fish 26.0 inches and larger declined 76 percent between the 1955-1963 and 1964-1966 periods. Within 5 years after stocking, anglers caught only 6.6 percent of the stocked fish, comprising 9.1 percent of the pounds stocked. Ninety percent of the total number and 78 percent of the total pounds caught were taken the first year after stocking. In addition, the harvest of native pike declined drastically after stocking. Sampling in downstream areas indicated that possibly 30 percent or more of the total number of pike stocked in Murphy Flowage had moved out of the flowage by the spring of 1965. Maximum downstream movement appeared to occur during the spawning period, involved largely stocked fish and was significantly related to population density. In addition to harvest and emigration, pike were also lost as a result of observed natural mortality caused by a parasite, Myxobolus, believed to have been introduced at the time of stocking. Total observed mortality was significantly related to population density, and mortality of larger native pike was greater than that of smaller native pike. Mortality from all causes averaged 60 percent for 9 years prior to stocking, while the first year after stocking, total mortality was 90 percent for both stocked and native pike. Total mortality remained higher than the prestocking average for 3 years. Stocking of northern pike had no discernible impact on the bluegill population. After stocking, numbers of bluegills, particularly small ones, continued to increase, while their growth continued to decline. Impact of stocked pike on the native pike population and angler harvest was also unfavorable. By 1965, the second year after stocking, harvest of native pike had declined to the lowest level during the 9 preceding years and by 1966, the standing crop of native pike had declined to its lowest level in the preceding 6-year period. The decision to stock northern pike in a given body of water should be carefully considered if a lake is to be stocked to either establish, maintain, or increase a northern pike population. It is suggested that the total density after stocking of large fingerlings (10-18 inches) not exceed 8 pike/acre. If the lake to be stocked already contains a native northern pike population, the fish populations should ideally be monitored prior to stocking in order to determine whether the lake can support more pike and to avoid the problems caused when the carrying capacity is exceeded. (Auth.)

18461. Kristoffersson, Rolf, Saara Broberg, Aimo Oikari, and Marketta Pekkarinen (Div. of Physiol. Zool., Dept. of Zool., Univ. of Helsinki, Arkadiankatu 7, SF-00100 Helsinki 10, Finland). 1974. EFFECT OF A SUBLETHAL CONCENTRATION OF PHENOL ON SOME BLOOD PLASMA ENZYME ACTIVITIES IN THE PIKE (Esox lucius L.) IN BRACKISH WATER. Annales Zoologici Fennici, 11(3): 220-223.

In pike kept for 8 days in brackish water (about 6 °/oo S) containing about 5 ppm phenol at 10°C, the activities of the plasma enzymes lactate dehydrogenase (LDH), glutamate-oxaloacetate transaminase (GOT), and glutamate-pyruvate transaminase (GPT) were found to be significantly elevated. The activity of cholinesterase (ChE) remained unchanged. (Authors)

18462. Werner, Earl E., and Donald J. Hall (Zool. Dept., Michigan State Univ., East Lansing, Michigan 48824). 1974. OPTIMAL FORAGING AND THE SIZE SELECTION OF PREY BY THE BLUEGILL SUNFISH (Lepomis macrochirus). Ecology, 55(5): 1042-1052.

The bluegill sunfish, Lepomis macrochirus, is known to select prey on the basis of size. We present evidence that this size selection is related to the optimal allocation of time spent searching for, and handling prey. A model relating search and handling time to energy return is constructed to determine the optimal breadth of diet. Prey are permitted to differ in size and relative abundance. All elements of the model are estimated from experiments with the bluegill feeding on populations constructed from size classes of Daphnia magna. Relative visibility of the different prey sizes markedly affects relative encounter rates or "effective" proportions. Effective proportions are determined empirically from feeding experiments and theoretically from reaction distance in order to correct for this bias. Search time is then manipulated by varying absolute abundance of prey. At low absolute abundance, prey of different size are eaten as encountered. As prey abundance is increased, size classes are dropped sequentially from the diet in accordance with the theory. Search and handling times are estimated for these experiments and quantitative comparisons with the model indicate these changes in diet maximize return with respect to time spent foraging. (Authors)

18463. Qadri, S. U. (Dept. of Biol., Univ. of Ottawa, Ottawa, Ontario, Canada). 1974. TAXONOMIC STATUS OF THE Salvelinus alpinus COMPLEX. J. Fish. Res. Board Can., 31(8): 1355-1361.

Minor differences in osteology and morphology were observed in the eastern North American species of charrs Salvelinus aureolus (Sunapee), S. marstoni (Quebec red), and S. oquassa (blueback). The coefficient of difference values, which determine the degree of overlap were lower than 1.28 for the total numbers of vertebrae, ribs, epineurals, gill rakers, branchiostegals, pores on the lateral line scales, and also for many morphological characters suggesting that the three chars are conspecific and should be synonymized as S. alpinus oquassa. (Auth.)

18464. Joseph, James, Witold L. Klawe, and Craig J. Orange (Inter-American Tropical Tuna Comm., c/o Scripps Inst. of Oceanogr., La Jolla, Calif. 92037). 1974. A REVIEW OF THE LONGLINE FISHERY FOR BILLFISHES IN THE EASTERN PACIFIC OCEAN. NOAA Tech. Report NMFS SSRF-675, pp. 309-331.

Catch and effort statistics from the Japanese longline fishery are used to examine the quarterly distribution of each of the six species of billfishes taken in the eastern Pacific Ocean east of long. 130°W. Striped marlin appear to be the most widely distributed billfish in the eastern Pacific. Blue marlin are confined more to the equatorial high seas regions than the other species. Sailfish are extremely abundant within 600 miles of the shoreline along Mexico and Central America. Shortbill spearfish are relatively sparsely distributed and less abundant in inshore waters than are sailfish. Black marlin are the least widely distributed and least abundant of the billfishes in the eastern Pacific. Swordfish are abundant in waters around Baja California, Mexico and near northern Peru and southern Ecuador. They are also frequently encountered in or near the cool upwelled waters along the equator. Trends in abundance, as reflected by catch/1,000 hooks and total catch, are discussed. On the southern grounds of the striped marlin fishery, apparent abundance of this species has dropped to about a third of its highest level, but fishing success has remained constant on the northern grounds. Catches of striped marlin reached their peak in 1968 (337,000 fish); by 1970 the catch had dropped to 180,000 fish. Apparent abundance and catches of blue marlin also decreased from levels in the early 1960's. In 1963, 75,000 blue marlin were taken but the catch decreased to about 22,000 fish by 1966 and has fluctuated about that level since. Because so few black marlin are taken in the eastern Pacific, trends in the abundance of this species are not discussed. The longline fishery for sailfish in the eastern Pacific began in a substantial way in 1965 with a catch rate of about 80 fish/1,000 hooks on the major sailfish grounds but by 1970 this had dropped to about 11 fish/1,000 hooks. Also catches on these grounds dropped from a peak of about 370,000 fish in 1965 to about 210,000 fish in 1970. Catches of swordfish continued

to increase from the beginning of the fishery in the 1950's until 1969, the peak year, when about 112,000 fish were landed. Catches decreased in 1970, although effort decreased also. The apparent abundance of swordfish has shown no general decreasing trends. A general discussion of the needs of scientific research on billfishes is given in the final section of the report. (Authors)

18465. Siddall, Scott E. (Dept. of Geol., Case Western Reserve Univ., Cleveland, Ohio 44106). 1974. STUDIES OF CLOSED MARINE CULTURE SYSTEMS. Prog. Fish-Cult., 36(1): 8-15.

The dynamics of the nitrogen cycle involving biological filters of closed marine culture systems were studied. The circulation of seawater solutions containing 3.3 mg-at NH_4-N/l (as $(NH_4)_2SO_4$) or 3 to 6 mg-at NH_4-N/l (as NH_4Cl) greatly increases filter nitrification rates. This may be due to an increase in the ratio nitrifying: heterotrophic bacteria on the filter. Well aerated, organic-free seawater is critical. Such preparations produce a uniform depth distribution of nitrifying bacteria throughout the gravel. An investigation into the relative buffering activities of several dolomitic limestone gravels used in closed culture systems indicates that an acid-insoluble, non-organic coating may form on the gravel, limiting solubility and buffering activity. Mixed algal culatures are shown to be useful in controlling nitrogen and organic compounds in culture water. Data are presented on the trace elements removed in algal cultivation. (Auth.)

18466. Jensen, Albert C. (Div. of Marine and Coastal Resources, N. Y. State Dept. of Environ. Conservation). 1974. NEW YORK'S FISHERIES FOR SCUP, SUMMER FLOUNDER AND BLACK SEA BASS. N. Y. Fish and Game Journal, 21(2): 126-134.

The reported commercial landings for New York's' marine fisheries show what appear to be serious declines in abundance. The heavy exploitation by foreign fishing fleets off our coast has been blamed for the declines. An examination of the data indicates that, for many species, the decline in commercial landings began well before the foreign fleets fished in the local coastal waters. Bilateral fishery agreements have been negotiated between the United States and the Union of Soviet Socialist Republics and the Polish Peoples Republic. Preparatory to the signing of these agreements, the Department of Environmental Conservation was requested to review New York's fisheries for scup, summer flounder and black sea bass. The results of the review indicate that the recreational fisheries are responsible for a substantial removal of the resource. It is suggested that as management plans are made for New York State's marine fisheries, serious consideration be given first to managing the recreational effort. (Auth.)

18467. Deufel, J. (Inst. f. Seenforsch. & Seenbewirtschaft, Langenargen, Germany). 1974. THERAPEUTIC AND PROPHYLACTIC TREATMENT OF FURUNCULOSIS. (Therapeutische und vorbeugende Behandlung der Furunkulose). Muench. Beitr. Abwasser, Fisch. Flussbiol., 25:33-39; Fish Health News, 3(4): p. 8.

Environmental conditions existing in ponds are very important in the control of furunculosis by drugs. The author calls it "Teichklime", which means the quality of environment. To improve these conditions trout should not be overfed, overcrowded, and water should have proper pH, dissolved oxygen and carbon dioxide. No unused food should be left. The following treatments are recommended: 1. As added to feed: Sulfamerazine-300 g mixed with 90 g sulfaquanidine for 100 kg of feed; 2. Furoxone-0.1-0.2 percent in feed; 3. Aureomycin (Chlortetracycline)- 0.1 to 0.2 percent in feed; 4. Carofur (a German nitrofuran soluble in water) - 0.1 to 0.2% in feed. It is a highly recommended drug. -- S. F. Snieszko

18468. Serebrov, L. I. (Polar Res. and Planning Inst. of Mar. Fishery and Oceanography, Murmansk, USSR). 1973. EFFECT OF A CURRENT ON THE INTENSITY OF FEEDING IN CERTAIN FISH. Hydrobiological Journal, 9(2): 68-70.

The feeding rate of guppies and minnows was investigated with and without the presence of a water current. Guppies consumed more food in the current than when there was no current. The minnows consumed food at the same rate whether there was a current or not.

18469. Bainbridge, K. L., F. M. D'Itri, and T. G. Bahr (Dept. of Fish. & Wildl., Michigan State Univ., East Lansing, Michigan). 1973. MERCURY DYNAMICS IN A WARM WATER STREAM. Inst. of Water Res., Mich. State Univ., Tech. Report No. 39, 71 p.; available from National Tech. Information Serv., Springfield Va. 22161 as PB-234 545, $4.00 paper copy, $2.25 in microfiche; Selected Water Resources Abstracts, 7(20): p. 38.

Sediments, fish, crayfish, benthos, and water from the Red Cedar River were collected periodically from a well-defined reach of the river and analyzed for mercury using flameless atomic adsorption methods. Samples of sewage were taken from the East Lansing Sewage Treatment Plant and analyzed to determine the amount of mercury contamination to the river from this source. Levels of mercury in the sediments ranged from 0.04 ppm (dry weight) at the upstream sample site to 0.40 ppm at the downstream sample site. It was estimated that an average of 64.5 grams per day were being carried into the East Lansing Sewage Treatment Plant while an average 17.9 grams per day of this mercury were entering the Red Cedar River at the sewage treatment plant outfall. There was no evidence to suggest that mercury was entering the Red Cedar River from the Red Cedar Golf Course. Levels of mercury in fish ranged from 0.17 ppm (wet weight) to 0.72 ppm. Predator species of fish contained significantly higher concentrations of mercury in their flesh than grazers or bottom feeding omnivores species of fish.

18470. Kolyushev, A. I. (Polar Res. and Planning Inst. for Sea Fisheries and Oceanography (PINRO), Murmansk, USSR). 1973. MATURATION AND FECUNDITY OF CHARS (GENUS Salvelinus) OF LAKES IMANDRA AND UMBOZERO. J. Ichthyol., 13(4): 524-536.

The maturation of the gonads and fecundity are described with special reference to the chars (genus Salvelinus) of Lakes Imandra and Umbozero. The specific nature of the sexual cycle governing the abundance of populations of Salvelinus under exploitation is discussed on the basis of the information obtained.

18471. Ciepielewski, Wladyslaw (Inst. Rybactwa Srodladowego, Zaklad Ichtiologii, Olsztyn-Kortowo Kierownik Zakladu). 1974. GROWTH, MORTALITY AND THE RELATION OF PRODUCTION TO BIOMASS OF Coregonus albula POPULATION IN THE LAKE MAROZ (Wzrost, Smiertelnosc i stosunek Produkcji do Biomasy Populacji Sielawy w Jeziorze Maroz). Roczniki Nauk Rolniczych, 96(2): 7-22.

Coregonus albula of the Lake Maroz in the second year of life reaches the body length more than 16 cm, and in the sixth year 22.5 cm. It is likely to suppose that the annual mortality rate of Coregonus albula in the lake is 0.4-0.7. Considerable fluctuation in the relation of production to the biomass of Coregonus albula population to be caught is the result of changes in the numbers of fish within individual age-groups. (Auth.'s synopsis)

18472. Markiw, Maria E., and Ken Wolf (U.S. Fish and Wildl. Service, Eastern Fish Dis. Lab., Kearneysville, West Virginia 25430). 1974. Myxosoma cerebralis: COMPARATIVE SENSITIVITY OF SPORE DETECTION METHODS. J. Fish. Res. Board Can., 31(10): 1597-1600.

Physical and biophysical methods of detecting spores of Myxosoma cerebralis were used in sequence on 87 individual fingerling rainbow trout (Salmo gairdneri) from two populations with a low incidence of infection. Physical methods of releasing spores from the organs of equilibrium, gill arches, or the axial skeleton gave an estimated rate of infection of 2.3-4.6%. Each succeeding step - pepsin digestion, trypsin digestion, and differential centrifugation through 55% dextrose solution - revealed additional infected fish. The final step of the sequence detected 10.5 times more infected fish than were found by examination of the organs of equilibrium or the axial skeleton with physical means; the true incidence was at least 24.1%. Procedures are described for using biophysical methods on 60-fish pools for hatchery inspection work and also on the more bony skeletons of mature fish. (Authors)

18473. Nehring, R. Barry, and John P. Goettl, Jr. (Colorado Div. of Wildlife, Fish. Res. Center, P. O. Box 2287, Fort Collins, Colorado 80521). 1974. ACUTE TOXICITY OF A ZINC-POLLUTED STREAM TO FOUR SPECIES OF SALMONIDS. Bull. Environ. Contamin. Toxicol., 12(4): 464-469.

Four species of salmonids were exposed to different dilutions of water from a stream polluted by zinc. Test duration was 14 days for all species. The TL_{50} for rainbow trout (Salmo gairdneri) was 0.41 mg zinc/liter. TL_{50} values for zinc to brown trout (Salmo trutta), cutthroat trout (Salmo clarki), and brook trout (Salvelinus fontinalis) were 0.64, 0.67, and 0.96 mg/liter, respectively. Rainbow trout were least tolerant of zinc and brook trout were the most tolerant. Cutthroat trout were considered more susceptible to zinc than brown trout. (Authors)

18474. Caballero R., Guillermina (Laboratorio de Helmintologia, Inst. de Biol. de la Universidad Nacional de Mexico, Mexico 20, D.F., Mexico). 1974. CONTRIBUTION TO THE KNOWLEDGE OF THE NEMATODES OF FISHES OF THE COAST OF MEXICO, III. TWO NEW FORMS. (Contribucion al Conocimiento de los Nematodos de Peces de los Litorales de Mexico, III. Dos Neuvas Formas). Publ. Biol. Inst. Inv. Cient., UANL, Mex., 1(4): 33-40. price $3.00. In Spanish with English summary.

In the present contribution, two parasites of fishes of the Mexican coast, Dollfusnema piscicola gen. nov., and Philometra centropomi spec. nov. are described. The species Dollfusnema piscicola found in the intestine of Paralabrax clathratus belongs to the family Spiruridae Oerley, 1885. The genus is characterized by: 1) Cephalic papillae of the external circle, double, placed on the lateral lips; 2) buccal capsule absent; 3) the esophagus is divided into two parts ending funnel-shaped at its anterior extremity; 4) spicules unequal and 5) four pairs of pedunculated preanal papillae. The species Philometra centropomi is found in the nasal mucosa of Centropomus undecimalis and is characterized fundamentally by having a very short esophagus as well as the vulva and excretory pore atrophied at the level of the esophagus-intestine junction. (Auth.'s summ.)

18475. Pauley, Gilbert B. (U.S. Fish and Wildl. Serv., Eastern Fish Disease Lab., Kearneysville, West Virginia 25430). 1974. FISH SPOROZOA: EXTRACTION OF ANTIGENS FROM Myxosoma cerebralis SPORES WHICH MIMIC TISSUE ANTIGENS OF RAINBOW TROUT (Salmo gairdneri). J. Fish. Res. Board Can., 31(9): 1481-1484.

This is the first report of an antigenic preparation from the spore stage of any histozoic sporozoan parasite. The method for successful extraction of the antigens is presented. This antigenic preparation is active in rabbits, but not salmonid fish. The detection of asymptomatic carrier fish using the spore antigens was not successful and evidence is presented to show that the parasite is successful because its antigens mimic those of trout. Immunoelectrophoresis indicates the parasite and trout antigens are different proteins. (Auth.)

18476. Bandow, Farrell. 1974. ALGAE CONTROL IN FISH PONDS THROUGH CHEMICAL CONTROL OF AVAILABLE NUTRIENTS. Minn. Dept. of Nat. Res., Div. of Fish & Wildl., Section of Fisheries, Investigational Report No. 326, 22 p.

Laboratory and pond tests were conducted to evaluate aluminum sulfate and the chelating agents Versene and Versenol 120 for limiting the availability of phosphorus and iron and thereby reducing the growth of algae in fish ponds. Aluminum sulfate rapidly removed substantial amounts of phosphorus without obvious harm to young walleyes or invertebrates. The response of algae populations to reduced phosphorus levels was variable. The chelating agents reduced iron concentrations in water but were ineffective in reducing algal growth. (Auth.)

18477. Nelson, Joseph S., and Martin J. Paetz (Dept. of Zool., The Univ. of Alberta, Edmonton, Alberta T6G 2E1, Canada). 1974. EVIDENCE FOR UNDERGROUND MOVEMENT OF FISHES IN WOOD BUFFALO NATIONAL PARK, CANADA, WITH NOTES ON RECENT COLLECTIONS MADE IN THE PARK. Can. Field Nat., 88(2): 157-162.

18478. Ogawa, Mizuho (Dept. of Biol., Saitama Univ., Urawa, Saitama, 338, Japan). 1974. THE EFFECTS OF BOVINE PROLACTIN, SEA WATER AND ENVIRONMENTAL CALCIUM ON WATER INFLUX IN ISOLATED GILLS OF THE EURYHALINE TELEOSTS, Anguilla japonica AND Salmo gairdnerii. Comp. Biochem. Physiol., 49(3A): 545-553.

The effects of bovine prolactin, sea water adaptation and environmental calcium on water influx into the isolated gills of the Japanese eel, Anguilla japonica, and rainbow trout, Salmo gairdnerii, were studied by an in vitro technique. An attempt was made to calculate the water permeability in these fishes from the rate of weight increase of isolated gills incubated in deionized water. The bovine prolactin injection significantly reduced the water influx into the isolated gills and/or water permeability. The water influx into the isolated gills and/or water permeability also dropped after adaptation to sea water. In the eel, the calcium content of fresh water also reduced the water influx into the isolated gills and/or their permeability to water compared with its value in fresh water. The decline in the rate of weight increase in isolated gills of the sea water-adapted eel seems to be due mainly to the effect of environmental calcium ions. (Auth.)

18479. Andrews, A. K., G. A. Earls, and R. C. Summerfelt (Oklahoma Coop. Fish. Unit, Okla. State Univ., Stillwater, Oklahoma 74074). 1974. RECREATIONAL USE OF AN OKLAHOMA SCENIC RIVER BISECTED BY A MAINSTREAM HYDROELECTRIC IMPOUNDMENT. D-J Completion Report, Federal Aid Project F-31-R-2, 108 p., 36 tables, 4 figs.

A creel survey was conducted from 1 August 1970 through 31 July 1971 on that part of the Mountain Fork River in Oklahoma above and below Broken Bow Reservoir. Objectives of the study were to evaluate and compare man-days fishing, hours fishing, fish harvest, species composition of the catch, expenditures per man-day, and total fisherman expenditures above and below the reservoir. Data were obtained by interviewing fishermen at the access points on the river in a stratified random sampling design with weekday, weekend, morning and afternoon strata. Public access was limited to 6 access points above and 8 access points below the reservoir. Total annual use was estimated to be 16,485 man-days and 34,386 hours fished. Total harvest was estimated to be 32,549 fish weighing 6,347 kg. Above fishermen accounted for 51% of the man-days, 47% of the hours fished, 84% of the fish, and 85% of the weight of fish. Analysis of harvest data indicates that the reservoir has affected species composition above and below the reservoir. The observed overall catch rates were 0.95 fish per hour and 0.10 kg/per hr. Average fish weight was 0.20 kg. Catch rates above were significantly ($P<0.01$) greater than below, while trip length below was significantly ($P<0.001$) longer than above. The mean expenditure per man-day for the entire river was $9.52. This was one of the highest average daily expenditures found in the literature and indicated that fishermen utilizing this resource considered it to be of relatively high quality. When comparing mean expenditure per man-day for sites grouped by habitat type, expenditures for the above site groupings were always significantly ($P<0.10$) greater than the two below site groupings. A reassessment of the value of the below fishery shows smaller pre- and post-construction values than were estimated in the pre-construction reports. Total expenditures by fishermen utilizing the river above and below the reservoir were $156,862 and the capitalized value of the resource was $5,975,695. (Authors)

18480. Colman, J. A. (Fish. Res. Div., Min. of Agric. and Fish., Wellington, New Zealand). 1974. GROWTH OF TWO SPECIES OF FLOUNDERS IN THE HAURAKI GULF, NEW ZEALAND. N. Z. J. Mar. Freshwater Res., 8(2): 351-370; Fisheries Res. Publication No. 222.

Growth of the sand flounder, Rhombosolea plebeia (Richardson), and the yellowbelly flounder, Rhombosolea leporina Günther, in the Hauraki Gulf is described. In both species females grow more quickly than males. At 2 years of age male and female sand flounders reach mean total lengths of 17 cm and 23 cm respectively, and the male and female yellow-belly flounders reach mean total lengths of 24 cm and 29 cm respectively. (Auth.)

18481. Brown, V. M., T. L. Shaw, and D. G. Shurben (Water Res. Centre, Stevenage Lab., United Kingdom). 1974. ASPECTS OF WATER QUALITY AND THE TOXICITY OF COPPER TO RAINBOW TROUT. Water Research, 8(10): 797-803.

Studies were made of the effects of additions of a sewage effluent, an amino acid, humic substances, and suspended organic matter on the acute lethal toxicity of water containing copper sulphate to rainbow trout. In all cases the toxicity of a given total concentration of copper was quantitatively reduced. It was concluded that neither the total concentration of copper nor that of "soluble" copper in a water could be used to determine the toxicity to fish which was attributable to copper. It was also concluded that data from toxicity tests with copper in which natural surface waters are used for dilution purposes cannot define the true toxicity of copper or have application to other natural waters except when the concentrations of the toxic chemical species are known. (Authors)

18482. Zonova, A. S. (State Res. Inst. for Lake and River Fisheries (GosNIORKh), Leningrad, USSR). 1973. THE CONNECTION BETWEEN EGG SIZE AND SOME OF THE CHARACTERS OF FEMALE CARP (Cyprinus carpio L.). J. Ichthyol., 13(5): 679-689.

An analysis is made of data on variability in the diameter of ovulated eggs and the connection of this character with some of the indicators of female carp (Cyprinus carpio L.). The size of ovulated eggs is positively correlated with the age of the females ($\eta^2 = 0.24$); mean egg size gradually increased and variability decreased. A negative correlation is established in older fish between egg size and relative fecundity. This character does not correlate with the length, weight, condition and working fecundity of the females. Nor did egg size affect the survival of the carp embryos.

18483. Amend, Donald F., and Lynnwood Smith (U.S. Fish and Wildlife Service, Western Fish Disease Lab., Seattle, Washington 98115). 1974. PATHOPHYSIOLOGY OF INFECTIOUS HEMATOPOIETIC NECROSIS VIRUS DISEASE IN RAINBOW TROUT (Salmo gairdneri): EARLY CHANGES IN BLOOD AND ASPECTS OF THE IMMUNE RESPONSE AFTER INJECTION OF IHN VIRUS. J. Fish. Res. Board Can., 31(8): 1371-1378.

Juvenile rainbow trout (Salmo gairdneri) were injected with infectious hematopoietic necrosis (IHN) virus and various hematological and blood chemical changes were monitored over 9 days. The packed cell volume, hemoglobin, red blood cell count, and plasma bicarbonate were significantly depressed by day 4. Plasma chloride, calcium, phosphorus, total protein, and blood cell types did not change during the 9 days. Furthermore, plasma B_4^2 LDH isozyme was significantly increased by the fourth day, and fish infected with infectious pancreatic necrosis virus, Vibrio anguillarum, Aeromonas salmonicida, and redmouth bacterium did not show specific LDH isozyme alterations. Acid-base alterations occurred at 10 C but not at 18 C. The acid-base imbalance and elevation of the B_4^2 LDH isozyme were consistently associated with the early development of the disease. The immune response after injection of IHN virus was determined and protection from disease was tested by passive immunization. Actively immunized fish developed IHN-neutralizing antibodies within 54 days after injection of virus, and the antibodies were protective when juvenile fish were passively immunized and experimentally challenged with IHN virus. (Authors)

18484. Trust, T. J., and R. A. H. Sparrow (Dept. of Bacteriol. and Biochem., Univ. of Victoria, Victoria, British Columbia, Canada). 1974. THE BACTERIAL FLORA IN THE ALIMENTARY TRACT OF FRESHWATER SALMONID FISHES. Can. J. Microbiol., 20(9): 1219-1228.

The bacterial flora in the alimentary tract of five species of freshwater salmonid fishes was examined both qualitatively and quantitatively. The fish were obtained from 16 different locations in British Columbia. The predominant microflora consisted of Gram-negative rods with species of Enterobacter, Aeromonas, and Acinetobacter present in the largest numbers. As many as 10^8 viable organisms per gram wet weight of alimentary tract plus contents were counted. (Authors)

18485. Tovell, P. W. A., C. Newsome, and D. Howes (Environ. Safety Div., Unilever Res. Lab. Colworth/Welwyn, Colworth House, Sharnbrook, Bedford, England). 1974. EFFECT OF WATER HARDNESS ON THE TOXICITY OF AN ANIONIC DETERGENT TO FISH. Water Research, 8(5): 291-296.

The toxicity to fish of anionic detergents in solution varies considerably according to the hardness of the water in which the fish are treated. Trout and goldfish are more susceptible to sodium lauryl sulphate (SLS) in hard water than soft, and the rate of absorption of detergent is greater in hard water. It has been shown that the concentration of bivalent cations has a direct effect on the toxicity of SLS. Acclimatization experiments have shown that the toxicity of SLS depends not only on the hardness of the water in which the fish are treated, but also on the hardness of the water in which the fish have previously been acclimatized. The mechanism whereby water hardness affects detergent toxicity is discussed. (Authors)

18486. Braekevelt, C. R. (Dept. of Anatomy, The Univ. of Manitoba, Winnipeg, Manitoba R3E 0W3, Canada). 1974. FINE STRUCTURE OF THE RETINAL PIGMENT EPITHELIUM, BRUCH'S MEMBRANE, AND CHORIOCAPILLARIS IN THE NORTHERN PIKE (Esox lucius). J. Fish. Res. Board Can., 31(10): 1601-1605.

The fine structure of the retinal pigment epithelium, Bruch's membrane, and the choriocapillaris has been studied by light and electron microscopy in the adult northern pike (Esox lucius). The pigment epithelium is composed of a single layer of large cells. Each epithelial cell has abundant mitochondria, smooth endoplasmic reticulum, myeloid bodies, phagosomes, and pigment granules. Rough endoplasmic reticulum and ribosomes are scarce. The scleral or basal border of the epithelial cell is not infolded whereas the vitreal or apical surface displays numerous, fine, elongated processes which surround the inner and outer segments of the photoreceptors. Bruch's membrane is composed of three layers. The innermost layer is the basal lamina of the pigment epithelium. The outermost layer is the basal lamina of the choriocapillaris endothelium. Between these basal laminae is a layer of fine fibrils. The overall thickness of Bruch's membrane is 3.5-4 μ posteriorly. The endothelial wall of the choriocapillaris bordering Bruch's membrane is typically very thin but nonfenestrated. Vesicles are common in the endothelial cytoplasm. This region of the pike eye differs morphologically from that described for most other vertebrates. (Auth.)

18487. Edwards, D. J. (Fish. Res. Div., Min. of Agric. and Fish., P. O. Ngapuna, Rotorua, New Zealand). 1974. WEED PREFERENCE AND GROWTH OF YOUNG GRASS CARP IN NEW ZEALAND. Reprint from N. Z. J. Mar. Freshwater Res., 8(2): 341-350; Fisheries Res. Publication No. 223.

In each of eight 5-day pond experiments carried out at intervals over a year, 0+ to 1+ year-old grass carp, Ctenopharyngodon idella Val., were offered a choice of at least 10 species of water weeds from the Rotorua area. Water temperature was measured each day. Food selectivity decreased with increasing temperature and size of fish, but preference for the weeds did not change. At summer temperatures the fish ate much weed and grew at about 4 g/fish/day, but in winter little food was taken and growth was slow. (Auth.)

18488. Richards, William J., Robert Victor Miller, and Edward D. Houde (Southeast Fish. Center, NMFS, NOAA, Miami, Florida 33149). 1974. EGG AND LARVAL DEVELOPMENT OF THE ATLANTIC THREAD HERRING, Opisthonema oglinum. NOAA Fishery Bull., 72(4): 1123-1136.

The egg and larval development of Atlantic thread herring, Opisthonema oglinum, is described, based on wild-caught eggs and laboratory-reared larvae. This description includes morphological details of the egg and osteological development, changes in body shape and pigmentation, and significant features of transformation of the larval development stages. The egg is 1.10 to 1.28 mm in diameter with a single oil globule. Ossification commences in the larvae when they attain 10 mm in standard length and all bones have at least begun to ossify by 20 mm. During transformation (15 to 25 mm), the larvae assume juvenile characteristics; particularly evident during this period is the anterior movement of the dorsal and anal fins from their posterior larval positions to their medial adult positions. (Authors)

18489. Verigin, B. V. (Dept. of Ichthyology, Moscow Univ., Moscow, USSR). 1973. A GENERAL OUTLINE OF DEVELOPMENT OF THE PRINCIPLES INVOLVED IN THE INTENSIFICATION OF FISHERIES AND THE PLANNING OF RESEARCH. J. Ichthyol., 13(3): 325-334.

A general outline of the transformation which has taken place and of that which is possible in intensification techniques is given on the basis of an analysis of the main features and trends in the development of fishery activities. One aspect of the outline is to provide for the consecutive examination of means of increasing the fish productivity of ever larger bodies of water and another is to increase the effectiveness of the exploitation of biogenic ingredients by the use of industrial methods of fish production. The proposed method of schematization is such that research may be more purposefully organized, using network planning methods.

18490. Bams, Robert A. (Dept. of the Environ., Fish. and Mar. Service, Pacific Biol. Sta., Nanaimo, British Columbia, Canada). 1974. GRAVEL INCUBATORS: A SECOND EVALUATION ON PINK SALMON, Oncorhynchus gorbuscha, INCLUDING ADULT RETURNS. J. Fish. Res. Board Can., 31(8): 1379-1385.

A hatchery method designed for mass production of unfed Pacific salmon fry and utilizing a gravel medium during most of the incubation period is being evaluated on successive cycles of a stock of pink salmon, Oncorhynchus gorbuscha, of the Tsolum River, B.C. Possible treatment effects are studied at emergent fry and returning adult stages in artificially and naturally propagated populations. Average growth rate and, hence, efficiency of yolk conversion were unimpeded in the hatchery environment, but fry emerged 11 days prematurely. Survival from green egg to emergent fry averaged 74.9% in the hatchery and 20.6% in the creek, for a gain ratio at emergence of 3.63. Recovery of selectively marked populations of hatchery and creek fish demonstrated almost identical survival rates from fry to adult stages and a final gain ratio of 3.46. Adult lengths and weights, fecundity, and timing of migrations were unaffected generally by the hatchery treatment. (Auth.)

18491. Falk, M. R., and D. V. Gillman. 1974. IMPACT OF A SPORT FISHERY ON ARCTIC GRAYLING IN THE BRABANT ISLAND AREA, NORTHWEST TERRITORIES. Environ. Can., Technical Report Series No.: CEN/T-74-7, Resource Mgmt Branch, 21 p.

During the summers of 1972 and 1973 a creel census and sampling program was carried out for Arctic grayling Thymallus arcticus (Pallas) caught in the Brabant Island area of Great Slave Lake, Northwest Territories. An estimated 175 anglers visited the lodge called Brabant Island Camp each year. They caught a total of 1030 grayling (815.1 kg) and retained 770 (558.8 kg). Angler success was 1.73 grayling per rod-hour in 1972 and 1.11 per rod-hour in 1973. A comparison was made between 386 angled grayling from the present study and 666 angled grayling collected during 1965 and 1966. Means of length and weight were 394.8 mm and 833.6 g for 1965-66 and 336.5 mm and 782.9 g for 1972-73. The average age decreased from 6.5 (range: 1-12) years in 1965-66 to 6.1 (range: 2-9) years in 1972-73. The modal age shifted from age 8 in 1965-66 to age 6 in 1972-73 which is near the age of first sexual maturity (age 5). The calculated slope (b) of the length-weight regression was significantly lower ($p = 0.05$) for the 1972-73 sample. Growth in length and weight was similar for both samples but grayling from the present study consistently averaged less in weight at any given age. Annual mortality rates calculated from ages 8 to 12 for 1965-66 and ages 6 to 9 for 1972-72 were 63.3 and 69.7 percent, respectively. In both samples males outnumbered females by ratios of 0.42 F:1M for 1965-66 and 0.63 F:1M for 1972-73. In view of the decrease in the average length and age, the encroachment of the modal age to that of first sexual maturity and the susceptibility of grayling to overfishing the spawning female segment of the Brabant Island grayling population must be protected. A minimum size limit of 14 inches is proposed for the outlet of Great Slave Lake from 116° to 118° longitude as well as for the drainages entering this region. (Authors)

18492. Post, George, and Robert A. Leasure (Colo. State Univ., Fort Collins, Colorado 80521). 1974. SUBLETHAL EFFECT OF MALATHION TO THREE SALMONID SPECIES. Bull. Environ. Contamin. Toxicol., 12(3): 312-319.

18493. Trust, T. J. (Dept. of Bacteriol. and Biochem., Univ. of Victoria, Victoria, British Columbia, Canada). 1974. STERILITY OF SALMONID ROE AND PRACTICALITY OF HATCHING GNOTOBIOTIC SALMONID FISH. Applied Microbiology, 28(3): 340-341.

The ventral surface of spawning salmonid fish was opened aseptically and the roe were removed aseptically. Roe obtained by using this technique were demonstrated to be sterile. Aseptic fertilization and incubation of eggs obtained in this manner resulted in the hatching of gnotobiotic salmonid fish. (Auth.)

18494. Crossman, John S., John Cairns, Jr., and Roger L. Kaesler (Teledyne Brown Engineering, Huntsville, Alabama 35807). 1973. AQUATIC INVERTEBRATE RECOVERY IN THE CLINCH RIVER FOLLOWING HAZARDOUS SPILLS AND FLOODS. Virginia Water Resources Res. Center, Virginia Polytech. Inst. and State Univ., Blacksburg, Va. 24061, Bulletin 63, 56 p.

The aquatic environment of the Clinch River in southwestern Virginia has been acutely stressed by two spills of hazardous materials. In 1967, caustic wastewaters from a fly-ash pond caused extensive damage to the biota. In 1971, a spill of sulfuric acid had a similar, though more restricted, effect. Both spills came from Appalachian Power Company's power plant at Carbo, Virginia. In addition to the acute pollutional stress from the two spills, a limited portion of the river has been chronically stressed by the day-to-day operations of the power plant. Moreover, periodic flooding has had short-term deleterious effects on the biota. The benthic macroinvertebrate community was sampled in 1969, 1970, and 1971 at 21 ecologically similar stations to assess the effects of the two spills and to determine the effects of flooding. The methods used to describe the indigenous macrobenthic communities were numbers of organisms, density, diversity, and cluster analysis of presence-absence data. Results from the first year's survey indicated that except for molluscs, the stream's macrobenthos had virtually recovered from the 1967 fly-ash pond spill. Information from the second year's survey also tended to support this observation, although an unexpected acid spill seriously reduced biological diversity at four stations immediately below the power plant for approximately three months. The third year's survey was similar to the surveys done in 1969 and 1970 except the field work was completed two to three weeks after late spring flooding. Results from these collections indicated that flooding had an equalizing effect on the macrobenthos at the different stations, i.e., areas that were usually sparsely inhabitated became richer in species. Stations previously very rich in species, on the other hand, tended to lose species so that after flooding, all stations were faunally more similar than they were at other times of the year when flooding was less severe or not as close to the time of sampling. (Authors)

18495. Richkus, W. A. (Grad. School of Oceanogr., Univ. of Rhode Island, Kingston, Rhode Island 02881). 1974. FACTORS INFLUENCING THE SEASONAL AND DAILY PATTERNS OF ALEWIFE (Alosa pseudoharengus) MIGRATION IN A RHODE ISLAND RIVER. J. Fish. Res. Board Can., 31(9): 1485-1497.

Continuous time series records of numbers of fish ascending a Denil-type fishway on the Annaquatucket River, North Kingstown, R.I., were obtained with a Smith-Root electronic fish counter during 1971 and 1972 spawning migrations. Seasonal trends in numbers of fish counted per day were unimodal and showed similar time patterns in both years. Water temperatures delimited the seasonal migration period. Short-term fluctuations in fish movement showed a significant zero-lag positive correlation with fluctuations in water temperature and a significant positive correlation with fluctuations in volume outflow when lagged 2 days behind outflow. A 10-14 day cycle appeared in fish migration data. Light intensity determined when alewife (Alosa pseudoharengus) movement would occur during a 24-h period, whereas water temperature controlled the pattern of movement exhibited during daylight hours. Fish responded to hourly water temperatures on the basis of their value relative to a changing baseline temperature. (Auth.)

18496. McCleave, James D., and Stephen M. Fried (Dept. of Zool., Univ. of Maine, Orono, Maine 04473). 1974. THREE UNUSUAL SHORTNOSE STURGEONS (Acipenser brevirostrum) FROM MONTSWEAG BAY, MAINE. Can. Field-Nat., 88(3): 359-360.

18497. Wildish, D. J. (Dept. of Environ., Fish. Res. Board of Can., Biol. Sta., St. Andrews, New Brunswick, Canada). 1974. ARRESTANT EFFECT OF POLYOXYETHYLENE ESTERS ON SWIMMING IN THE WINTER FLOUNDER. Water Research, 8(8): 579-583.

Sublethal concentrations of the oil dispersant Gulf Agent 1009 Lot No. LS-3712 are shown to have an arrestant effect on swimming in the winter flounder (Pseudopleuronectes americanus). The effect involves suppression of endogenous tidal rhythm and reductions in swimming amplitude. The effective threshold of a pure fatty acid polyoxyethylene ester - the main active ingredient in the oil dispersant - was found to lie between 0.1 and 1.0 mg l^{-1} for decrease in swimming amplitude. (Auth.)

18498. Meehan, William R., and Steven T. Elliott (Forest Service, U.S. Dept. of Agric., Pacific Northwest Forest and Range Exp. Sta., Juneau, Alaska 99801). 1974. COMPARATIVE EFFECTIVENESS OF THE STANDARD SURBER SAMPLER AND A HYDRAULIC MODIFICATION FOR ESTIMATING BOTTOM FAUNA POPULATIONS. Prog. Fish-Cult., 36(1): 16-19.

Comparisons were made of the efficiency of sampling bottom fauna with the standard Surber sampler and a modification of this technique which uses a hydraulic pump to agitate the sample area. Variations in biomass of fauna within each method were so great that no significant differences between methods could be demonstrated. Problems encountered in the use of the two methods are discussed. (Authors)

18499. Dodson, Julian J., and William C. Leggett (Dept. of Biol., McGill Univ., P.O. Box 6070, Montreal, Quebec H3C 3G1, Canada). 1974. ROLE OF OLFACTION AND VISION IN THE BEHAVIOR OF AMERICAN SHAD (Alosa sapidissima) HOMING TO THE CONNECTICUT RIVER FROM LONG ISLAND SOUND. J. Fish. Res. Board Can., 31(10): 1607-1619.

Twenty-two adult American shad (Alosa sapidissima), captured, sensory-impaired, sonic-tagged, and released adjacent to and 10 km west of the Connecticut River, were tracked in Long Island Sound in 1972. Both anosmic and blind/anosmic shad oriented into the tidal current and altered swimming speeds in relation to changes in tidal current velocity as do unimpaired fish. They did not, however, exhibit the consistency in these behavioral responses that resulted in westerly displacement in unimpaired shad. Blind shad exhibited neither of these behavior patterns but did tend to affect a westerly displacement in Long Island Sound. Dart-tagged adult shad that were sensory-impaired and released without displacement in the same areas of Long Island Sound in 1971 and 1972 homed less successfully to the Connecticut River than did unimpaired dart-tagged shad released in the same years. Anosmic dart-tagged shad located the Connecticut River less successfully than unimpaired shad. Blind shad successfully located the river from 10 km distance but failed to do so when released adjacent to the river. Blind/anosmic shad failed to locate the river from either release site. It was concluded that an olfactory-rheotaxic mechanism forms the basis of the location of the Connecticut River by shad. The preferred direction of displacement appears to be established by olfactory clues indicative of the Connecticut River whereas the orientation along the migratory path is maintained by reference to the rate and direction of tidal currents. Vision alone cannot account for this rheotaxic response. (Authors)

18500. Molnar, Kalman, and George Hanek (Dept. of Biol., Univ. of Waterloo, Waterloo, Ontario, N2L 3G1, Canada). 1974. SEVEN NEW Eimeria spp. (PROTOZOA, COCCIDIA) FROM FRESHWATER FISHES OF CANADA. Journal of Protozoology, 21(4): 489-493.

Seven new species of Eimeria are described and figured from the freshwater fishes of Ontario and Quebec, Canada. They are Eimeria catostomi sp. n. and E. fernandoae sp. n. from Catostomus commersoni (Lacépède), E. etheostomae sp. n. from Etheostoma exile (Girard), E. hoffmani sp. n. from Umbra limi (Kirtland), E. micropteri sp. n. from Micropterus dolomieui Lacépède, E. pungitii sp. n. from Pungitius pungitius (Linnaeus), and E. salvelini sp. n. from Salvelinus fontinalis (Mitchill). Furthermore, 2 new host records and 2 new distribution records for North America are reported for E. anguillae Leger & Hollande, 1922 and E. truttae Leger & Hesse, 1919 respectively. Finally, morphologically similar oocysts found in various cyprinids are regarded as belonging to E. iroquoina Molnar & Fernando, 1974. (Authors' synopsis)

18501. Gilmore, Gil, and Lee Trent (Mar. Lab., Texas A&M Univ., Galveston, Texas 77550). 1974. ABUNDANCE OF BENTHIC MACROINVERTEBRATES IN NATURAL AND ALTERED ESTUARINE AREAS. NOAA Tech. Report NMFS SSRF-677, 13 p.

The abundance of benthic macroinvertebrates during March-October 1969 in West Bay, Texas, was compared between 1) a natural marsh area, 2) an adjacent marsh area altered by channelization, bulkheading, and filling, and 3) an open bay area. Animals representing four phyla were caught. Abundance indices (areas combined) of the four groups in terms of numbers were 66.4% polychaetes, 29.6% crustaceans, 2.5% pelecypods, and 1.5% nemerteans; volumes were 44.0% polychaetes, 40.8% pelecypods, 10.7% nemerteans, and 4.4% crustaceans. When all organisms were combined, they were slightly more abundant numerically and over twice as abundant volumetrically in the marsh than in the canals and were least abundant in the bay. Polychaetes were most abundant in the canals and least abundant in the bay; abundance was highest at stations with low to intermediate amounts of silt and clay or where vegetative matter was composed mostly of live sea grasses or detritus. Crustaceans were more abundant in the natural marsh than in the other two areas and showed a definite preference for sandy substrate in marsh areas. Pelecypods were numerically most abundant in the bay but volumetrically the marsh had the highest standing crop. Nemerteans were most abundant in the marsh and least abundant in the bay. In general, the seasonal abundance of polychaetes and nemerteans varied little during the study, whereas crustaceans and pelecypods were abundant only during the spring and early summer. An exception to this seasonal abundance pattern was the reduction in numbers of polychaetes at the uppermost canal station where the habitat was apparently unsuitable due to low oxygen levels during the summer and early fall. (Authors)

18502. FAO OF THE UN (Rome, Italy). 1974. FAO AQUACULTURE BULLETIN. A QUARTERLY NEWS DIGEST OF AQUACULTURE RESEARCH AND DEVELOPMENT. FAO Aquacult. Bull., 6(4): 32 p., illus.

Text includes: From research institutions...Cryo-preservation of fish spermatozoa - Induced breeding of siganids - Induced spawning of speckled trout - Rearing of grey mullet - Rearing of major carp spawn - Larval rearing of turbot - Mass production of pike fingerlings - Culture of algae for larval food - Synchronized hatching of palaemonid eggs - Improved method of Macrobrachium rearing - Culture possibilities of sabatella (Brycon) - Rotifers as food for fish larvae - Production of mussel larvae as food for fish larvae - Plant proteins in trout feeds - Shrimp farming in Colombia - Polyculture of common carp and bighead - Improved techniques of fish seed production in India - Polyculture of carps in India - Ammonia for the control of predators - Fish production in sewage-fed ponds - Product quality of cultured fish. Aquaculture development...Bulgaria - Cuba - France - Israel - Korea, Rep. of - New Zealand - Norway - Philippines - Thailand - United Kingdom - United States. Fish diseases and their control...Vectors of viral haemorrhagic septicaemia - Gulls as possible vectors of trout pathogenic viruses - Infectious pancreatic necrosis in Scotland - Immunoprophylaxis of spring viraemia of carp - Serum neutralization test for Rhabdovirus carpio - Studies on infectious dropsy complex of carp - Quantitative studies on the spores of Myxosoma cerebralis - Genetic factors as control mechanism against diseases - Control of bacterial fish diseases - Treatment of infectious prawn diseases - Treatment of furunculosis - Treatment of carp ichthyophthiriasis. Fish and shellfish introductions...Recent introductions - Introduction of Pacific oyster in Ireland - Tilapia introductions in Puerto Rico - Coho salmon in Alaska waters. (From Contents)

18503. Bretschneider, F. (Lab. voor Vergel. Fysiol., Jan van Galenstraat 40, Utrecht, The Netherlands). 1974. ELECTRORECEPTIVE PROPERTIES OF Siluris glanis (L.). Experientia, 30(9): p. 1035.

Silurus possesses an electroreceptive system which may well function in prey detection and/or orientation, as found in Ictalurus. (From text)

18504. Hagenmaier, Hans E. (Inst. of Zool., Univ. of Munster, 44 Munster, West Germany). 1974. THE HATCHING PROCESS IN FISH EMBRYOS - IV. THE ENZYMOLOGICAL PROPERTIES OF A HIGHLY PURIFIED ENZYME (CHORIONASE) FROM THE HATCHING FLUID OF THE RAINBOW TROUT, Salmo gairdneri Rich. Comp. Biochem. Physiol., 49(2B): 313-324.

A choriolytic enzyme (hatching enzyme) of the teleost Salmo gairdneri was isolated from the hatching fluid after stimulating the still-encased larvae with dissolved nitrogen. The enzyme was purified by gel filtration on Sephadex G-75 and exchange chromatography on DEAE-cellulose. After gel filtration the enzyme is stable for 4 days at 25°C at an optimum pH of 8.5. Chorionase demonstrates no activity on the amino acid substrates APNE, BAEE, BANA, BTEE and GluPNA. There is no carboxypeptidase A and B activity on the synthetic substrates hippuryl-arginine and hippuryl-phenylalanine. The enzyme differs from the family of serine proteases in its complete resistance to corresponding inhibitors such as PMSFTLCK and TPCK. EDTA is the only agent with an inhibitory effect showing that the enzyme belongs to the metallo-proteases. The molecular weight is calculated by gel filtration to be 10,000. (Auth.)

18505. Bontemps, Stanislaw (Inst. Rybactwa Srodladowego, Zaklad Gospodarki Rybackiej w Rzekach i Zbiornikach Zaporowych, Zabieniec kolo Warszawy, Poland). 1974. TRIALS WITH KEEPING RAINBOW TROUT IN A POND SWELLED WITH WARMED WATER (Proba Przetrzymywania Pstragow Teczowych w Stawie Zasilanym woda Podgrzana). Roczniki Nauk Rolniczych, 96(1): 7-15.

Results of preliminary investigations into the fitness of warm water collected from the central part of Vistula River for cooling of generators at a power plant and then let out to the test pond for fish rearing. The test fish was rainbow trout of 100 g in individual weight. During the rearing period of four winter months the individual fish weight increase was found to be 240 g, and the stock survival rate was 90%. (Auth.'s synopsis)

18506. Olla, Bori L., and Carol Samet (U.S. Dept. of Comm., NOAA, NMFS, Middle Atlantic Coastal Fish. Center, Sandy Hook Lab., Highlands, New Jersey 07732). 1974. FISH-TO-FISH ATTRACTION AND THE FACILITATION OF FEEDING BEHAVIOR AS MEDIATED BY VISUAL STIMULI IN STRIPED MULLET, Mugil cephalus. J. Fish. Res. Board Can., 31(10): 1621-1630.

Single juvenile striped mullet, Mugil cephalus, tested in a specially designed experimental tank system, were allowed visual contact with a group of fish located in one of four adjacent tanks. Attraction of mullet isolates was greatest to a group of species mates, and less to bluefish, Pomatomus saltatrix, and Atlantic mackerel, Scomber scombrus, groups, respectively. To study the role of visual stimuli in feeding behavior, responses of mullet isolates were measured under three different test conditions: 1) absence of a group of species mates, 2) presence of a feeding group, and 3) presence of a nonfeeding group. Isolates tested in the absence of a group began feeding only after some delay, although the total number of subsequent feeding responses remained high. When isolates viewed a feeding group, the initiation of feeding was greatly facilitated, with the total number of feedings remaining high until the latter part of a test. Isolates viewing a nonfeeding group showed inhibition in the latency to feed as well as a low number of grazing responses. The significance of these observed responses is discussed. (Authors)

18507. Walter, Carl M., Harold G. Brown, and Charles P. Hensley (Environ. Pro. Agency, Region VII, Surveillance and Analysis Div., 25 Funston Road, Kansas City, Kansas 66115). 1974. DISTRIBUTION OF TOTAL MERCURY IN THE FISHES OF LAKE OAHE. Water Research, 8(7): 413-418.

In 1971, a joint Federal-State survey was conducted to investigate the total mercury content of fish and sediment in Lake Oahe, South Dakota. Average total mercury concentration of 225 fish flesh samples was 0.27 mg kg^{-1}; game fish samples averaged 0.31 mg kg^{-1} and nongame fish samples averaged 0.22 mg kg^{-1}. Frequency distributions of total mercury concentrations in the fish are presented by fish species and sampling location. Data include total mercury analyses of 43 sediment samples. (Authors)

18508. Potter, I. C., E. S. Robinson, and I. D. Brown (School of Biol. Sci., Univ. of Bath, England). 1974. STUDIES ON THE ERYTHROCYTES OF LARVAL AND ADULT LAMPREYS (Lampetra fluviatilis). Acta Zoologica, 55(3): 173-177.

The erythrocytes of larval and adult Lampetra fluviatilis were examined in suspensions of whole blood, solutions of various ionic strengths, scanning electron photomicrographs and air dried smears. Although a wide range of shapes were observed in hyper- and hypotonic solutions, the cells in whole blood and isotonic solutions were predominantly biconcave with an eccentric nucleus. The biconcave shape was also seen in scanning electron phtomicrographs of erythrocytes fixed with glutaraldehyde in lamprey Ringer. The mean diameter of larval and adult cells in whole blood suspensions was 11.2 and 11.6 μm respectively. Although in air dried smears the areas of the larval and adult erythrocytes were virtually identical, the erythrocyte nuclear area was markedly higher in ammocoetes with only a small amount of overlap between the values obtained for the two stages in the life cycle. (Authors)

18509. McDaniel, Mike D. (Ecol. Services Group., Texas Instruments, Inc., Northfield, Massachusetts 01360). 1974. DESIGN AND PRELIMINARY EVALUATION OF AN IMPROVED ARTIFICIAL SUBSTRATE SAMPLER FOR AQUATIC MACROINVERTEBRATES. Prog. Fish-Cult., 36(1): 23-25.

A number of artificial substrate devices have been developed to circumvent obstacles encountered in conventional benthic sampling for macroinvertebrates. These devices, at best, are only semi-quantitative, yet they provide freedom in selection of sampling site and homogeneity of substrate type and area. Their use can result in samples with good potential for comparisons within and among various aquatic ecosystems. An improved artificial substrate sampler has been developed that combines the features of a multiple-plate sampler with a synthetic webbing material. The new sampler is inexpensive, easily portable, and may be processed in the field and returned to the water or returned to the lab for processing. Preliminary results indicate that it is an effective sampling method in both lotic and lentic environments and that it possesses great potential for biological water quality monitoring.

18510. Ebel, Wesley J. (Northwest Fish. Center, NMFS, NOAA, Seattle, Washington). 1974. MARKING FISHES AND INVERTEBRATES. III. CODED WIRE TAGS USEFUL IN AUTOMATIC RECOVERY OF CHINOOK SALMON AND STEELHEAD TROUT. Marine Fish. Review, 36(7): 10-13.

The successful use of the coded wire tag (1 X 0.25 mm, placed in snout) for marking of juvenile Pacific salmon (Oncorhynchus spp.) and steelhead trout (Salmo gairdneri) migrating downstream in the Snake River is described. Problems associated with tagging and with detection of tags in adult fish previously marked as smolts are discussed. General descriptions of the automatic tag detector and adult fish separator are given. (Auth.)

18511. Mackiewicz, John S. (Biol. Sci., State Univ. of New York at Albany, Albany, New York 12222). 1974. THE GENUS Caryophyllaeus Gmelin (CESTOIDEA: CARYOPHYLLIDEA) IN THE NEARCTIC. Proc. Helminthol. Soc. Wash., 41(2): 184-191.

Review of literature records and study of specimens of Caryophyllaeus terebrans (Linton, 1893) from collections as well as new material from Catostomus ardens in Wyoming and Idaho has led to the following conclusions: there are no authentic records of Caryophyllaeus Gmelin in the Nearctic; C. terebrans (Linton, 1893) Woodland, 1923, is referable to the genus Glaridacris Cooper, 1920; and Hunter's (1930) description of "C." terebrans from Ictiobus bubalus is based largely on an undescribed genus. Glaridacris terebrans comb. n. is redescribed and discussed with respect to the following species: Hunterella nodulosa Mackiewicz and McCrae 1967, G. catostomi Cooper, 1920, and C. laticeps (Pallas, 1781. (Auth.)

18512. Valentine, Joseph J., and Edward J. Peterson (U.S. Fish & Wildl. Service, Lamar National Fish Hatchery, Lamar, Pa. 16848). 1974. STOCKING WALLEYE SAC FRY. Prog. Fish-Cult., 36(1): p. 7.

18513. Cutkomp, L. K. (Minn. Univ., Dept. of Entomol., Fisheries & Wildlife, St. Paul, Minnesota). 1974. A TISSUE ENZYME ASSAY FOR CHLORINATED HYDROCARBON INSECTICIDES. Environ. Protection Agency, Technology Series Report EPA-660-2-73-027, 39 p., available from GPO Sup. Doc. as EP1.23:660/2 73-027, $0.85; Selected Water Resources Abstracts, 7(20): p. 42.

Certain chlorinated hydrocarbon insecticides, especially DDT and closely related chemicals, tested at low concentrations, adversely affect the ATPase enzyme system. DDT inhibited oligo-mycin-sensitive Mg2 + ATPase (mitochondrial) both in vitro and in vivo. About 1 micromole gave 50% inhibition in fish brain and 0.5 ppb of DDT on water inhibited about 50% of mitochondrial Mg2 + ATPase. Na+-K+ APase was not inhibited in brain, but was inhibited in vivo in fish gills. Certain discriminating effects were found among chlorinated hydrocarbons, particularly with respect to inhibition of Mg2 + ATPase, but the ranking of compounds by enzymic effects does not always parallel toxicity values. Organophosphate and carbamate insecticides were ineffective. Further research is needed both in vitro and in vivo to determine how the adverse effects on the enzymes relate to practical interpretations of effects. The abnormally low ATPase activity in chronically treated fish is the first report of an adverse biochemical effect with sublethal doses of DDT. All effects appear to be primarily within the group of insecticides and acricides which are persistent in parts of the environment and in organisms.

18514. Tibbo, S. N., and A. Sreedharan (Fish. Res. Board Can., Biol. Sta., St. Andrews, New Brunswick, Canada). 1974. THE CANADIAN SWORDFISH FISHERY. NOAA Tech. Report NMFS SSRF-675, p. 296.

During the early 1960's the traditional harpoon fishery for swordfish off the east coast of Canada was replaced by a longline fishery. Fishing areas and seasons expanded, landings increased and size composition of the catch decreased. Catch and effort data for the period 1958 to 1970 covering both fishing methods were analyzed and the results are presented. (Authors)

18515. Engstrom-Heg, Robert. 1974. USE OF POWDERED ACTIVATED CARBON TO ELIMINATE ROTENONE TOXICITY IN STREAMS. N. Y. Fish and Game Journal, 21(2): 153-162.

Suspensions of powdered activated carbon were found to adsorb rotenone and eliminate toxicity to rotenone-sensitive fish in real and simulated stream situations. Laboratory tests showed that carbon-rotenone systems do not quickly reach equilibrium, and that appropriate concentrations and contact times can be estimated more accurately from a rate equation than from adsorbtion isotherms. In general, application at 30 ppm is adequate and will detoxify commonly used rotenone concentrations in 12 to 21 minutes. Required contact time is inversely proportional to carbon concentration and does not change greatly with increased rotenone concentration. Polysorbate 80 (Tween 80) and certain liquid diswashing detergents appear to release adsorbed rotenone into water. Carbon had a half-life in suspension of 22 hours in laboratory jars. It handled well as a 10 percent slurry, but it did not form even moderately stable 30 ppm suspensions in stream water unless introduced through a rotary mixing chamber. Even here, stability was markedly poorer than in jars. Carbon treatment causes a temporary black-to-gray discoloration of the stream bottom. Rotenone adsorbtion in stream tests corresponded well with predictions based on laboratory experiments. Activated carbon treatment is a viable alternative to potassium permanganate detoxification for use in unpolluted, relatively small streams. (Auth.)

18516. Roales, R. R., and A. Perlmutter (Lab. of Aquatic Biol., Dept. of Biol., Grad. School of Arts and Sci., New York Univ., New York, N. Y. 10003). 1974. TOXICITY OF ZINC AND CYGON, APPLIED SINGLY AND JOINTLY, TO ZEBRAFISH EMBRYOS. Bull. Environ. Contamin. Toxicol., 12(4): 475-480.

The zinc 24, 48 and 72 hour Tl_m and the Cygon 48 and 72 hour Tl_m were determined for zebrafish embryos. In addition, zinc, at low doses, was found to be antagonistic to the toxic action of Cygon on these embryos. At other levels tested, zinc and Cygon may interact additively. (Authors' summ.)

18517. Korovin, V. A., and N. P. Mitskevich (Siberian Animal Husbandry Res., Planning and Technological Inst., Novosibirsk, USSR). 1973. GROWTH AND CHEMICAL COMPOSITION OF JUVENILE CARP [Cyprinus carpio (L.)] IN RELATION TO THE QUALITY OF THE PARENTS AND TEMPERATURE CONDITIONS IN NURSERY PONDS. J. Ichthyol., 13(4): 543-549.

The effect of water temperature and the quality of the spawners on the growth and fat content of juvenile carp were investigated. A combination of environmental and genotypic factors has the maximum effect on growth rate ($\eta_{AB}^2 = 0.543 \pm 0.0028$); juveniles from parents of the best quality have growth advantages under any conditions. The chemical composition of the underyearlings and yearlings is wholly determined by heredity. The process of lipid accumulation proceeds uniformly during the first summer. Losses of weight and of reserve lipid during the overwintering period proceed less intensively in the elite juveniles than in their 1st and 2nd class cohorts. The data obtained demonstrate the need for selection in carp brood stocks.

18518. Bidgood, B. F. (Fish. Res. Section, Fish & Wildl. Div., Alberta Dept. of Lands & Forests, Edmonton, Alberta, Canada). 1974. REPRODUCTIVE POTENTIAL OF TWO LAKE WHITEFISH (Coregonus clupeaformis) POPULATIONS. J. Fish. Res. Board Can., 31(10): 1631-1639.

The reproductive potential of two lake whitefish (Coregonus clupeaformis) populations with dissimilar growth rates was studied and compared. The smaller-sized Pigeon Lake females and the larger-sized Buck Lake females had similar ratios of gonad weight to body weight during the gonad development period, but the Pigeon Lake fish produced fewer but larger eggs. Spawning occurred in both lakes for a period approaching 4 mo in both open water and under ice cover in a wide range of water temperatures. Concentrated spawning occurred in shallow water over a boulder, gravel, and sand surficial lake sediment of both lakes. The incubation of whitefish eggs was retarded under ice cover but accelerated to hatching as the water warmed and the ice left the lakes in the spring. The length of the egg incubation period, not the size of the egg under incubation, governed the size of the hatching lake whitefish. (Auth.)

18519. Ciepielewski, W. (Inst. Rybactwa Srodladowego, Zaklad Ichtiologii, Olsztyn-Kortowo, Poland). 1974. THE ESTIMATION OF EGGS QUANTITIES AND OF HATCH SURVIVAL RATE OF Coregonus albula IN THE LAKE MAROZ. (Obfitosc Skladanych jaj i Ocena Przezywalnosci Narybku Sielawy w Jeziorze Maroz). Roczniki Nauk Rolniczych, 96(2): 23-37. In Polish with English synopsis.

The relation of males to females in Coregonus albula populations within the age-groups of 1+ and 2+ was estimated to be approximately 1:1. Females were found to prevail within the elder age-groups. A spawner of the complement age population produced a spawn count from 3400 to 11,200, depending on the rate of mortality within an age-group. The fish survival rate is supposed to have a decisive effect upon the fertility of fish within an age-group. The number of Coregonus albula within an age-group in the Lake Maroz was found to be conditioned primarily by the survival rate of hatch up to the age of 0+. During the investigated period it was from 2.1 to 35%. (Auth.)

18520. Stolte, Lawrence W. (New Hampshire Fish & Game Dept., Concord, New Hampshire 03301). 1974. INTRODUCTION OF COHO SALMON INTO THE COASTAL WATERS OF NEW HAMPSHIRE. Prog. Fish-Cult., 36(1): 29-32.

The New Hampshire Fish and Game Department introduced coho salmon (Oncorhynchus kisutch) into her coastal waters during the spring of 1967 to investigate the possibility of providing an offshore and estuarine sport fishery. Marine survivals (percent return to the fishermen and parent streams) were low, estimates ranging from 2.38% to 3.44%. The mean individual sizes of the adult salmon ranged from 2.6 to 2.8 kg and 623 to 637 mm (fork length). Mean fecundities varied from 2,542 to 2,765 eggs. With the lack of suitable spawning habitat in any of the coastal streams in New Hampshire, coupled with high water temperatures during the summer, it is felt that the coho salmon program would be primarily hatchery dependent.

18521. Waiwood, K. G., and P. H. Johansen (Queen's Univ., Dept. of Biol., Kingston, Ontario, Canada). 1974. OXYGEN CONSUMPTION AND ACTIVITY OF THE WHITE SUCKER (Catostomus commersoni), IN LETHAL AND NONLETHAL LEVELS OF THE ORGANOCHLORINE INSECTICIDE, METHOXYCHLOR. Water Research, 8(7): 401-406.

The survival, oxygen consumption and spontaneous activity of suckers were determined at 15°C in water containing different concentrations of methoxychlor in ethanol, and no added substances. A dynamic bioassay was used to estimate the 96 h LC50, which was found to be 0.0345 ppm. Routine oxygen consumption was determined in a continuous-flow respirometer, and the activity was recorded in separate experiments by measuring the water disturbance using silver wire electrodes. After 24 h fish exposed to untreated, ethanol-treated and 0.01 ppm methoxychlor-treated water had oxygen uptake rates which were relatively constant and near standard levels. At 0.10 ppm methoxychlor (lethal to all fish within 85 h), oxygen consumption rates were 2-3.5 x as high as those of control fish. Activity also greatly increased. The fish lost their balance along with the coordination between opercular and locomotor movements. Suckers that died in 0.04 ppm methoxychlor showed oxygen uptake rates and poisoning symptoms similar to 0.10 ppm treated fish, while those that survived this treatment had rates similar to control fish. The increase in ventilation which accompanies this hyperactivity may result in increased uptake of insecticide and thereby explain the irreversible nature of the response. (Authors)

18522. Gjedrem, T., and D. Aulstad (Agric. Univ., Norway, Inst. Animal Gen. Breed., Aas-NLH, Norway). 1974. SELECTION EXPERIMENTS WITH SALMON. I. DIFFERENCES IN RESISTANCE TO VIBRIO DISEASE OF SALMON PARR (Salmo salar). Aquaculture, 31(1): 51-59; Fish Health News, 3(4): p. 9.

The research facilities at the fish experimental station at Sunndalsora are described. The design of a selection experiment with salmon and sea trout is presented. The station is also used for other purposes, such as investigations into nutrition, pathology and environmental factors. In this paper analyses of observed differences to vibrio disease (Vibrio anguillarum) are reported. Significant differences in resistance between river strains of salmon parr were found. The difference between localities are supposed to be partly heritable. The data were also used to estimate the heritability on an intra-river basis. The estimates were 0.12 and 0.07 based on the sire and dam component, respectively. It is concluded that selection against vibrio disease will result in genetic change. (Aquatic Sci. Fish. Abs. 4Q6047F).

18523. Vlymen, William J. III (Southwest Fish. Center, NMFS, NOAA, P.O. Box 271, La Jolla, California 92037). 1974. SWIMMING ENERGETICS OF THE LARVAL ANCHOVY, Engraulis mordax. NOAA Fish. Bull., 72(4): 885-899.

A modification of Gray and Hancock's theoretical method for studying propulsion of spermatozoa was used to estimate the energy expenditure of swimming anchovy, Engraulis mordax, larvae. Wave parameters obtained from photographs of feeding anchovy larvae were incorporated into a time dependent sinusoidal body displacement function which is used in the iterated energy integrals of the model. The integrals were numerically evaluated by 2-dimensional 16-point Gaussian-Legendre quadrature. The results for the mean larval length of 1.4 cm was 144.8 ergs/swimming excursion or 4.91×10^{-3} cal/h using known excursion rates. O_2 consumption measurement of similar size larvae indicate a 2.19×10^{-2} cal/h requirement. Extension to other larval sizes can be made using this model with certain qualifications. The relationships of swimming energetics to larval fish behavior are discussed. Current theories of large amplitude intermittent swimming are also discussed in light of the high swimming efficiencies encountered in this study. (Auth.)

18524. Tang, S. C. (Dept. of Agric. Chem., Oregon State Univ., Corvallis, Ore. 97331). 1974. UPTAKE, DISTRIBUTION, AND FATE OF ^{203}Hg-ETHYLMERCURIC CHLORIDE IN THE GUPPY AND THE COONTAIL. Environmental Research, 8(1): 112-118.

18525. Wenner, C. A., and J. A. Musick (Virginia Inst. of Marine Sci., Gloucester Point, Virginia 23062). 1974. FECUNDITY AND GONAD OBSERVATIONS OF THE AMERICAN EEL, Anguilla rostrata, MIGRATING FROM CHESAPEAKE BAY, VIRGINIA. J. Fish. Res. Board Can., 31(8): 1387-1391.

Fecundity of the American eel, Anguilla rostrata, was estimated from 21 specimens migrating from Chesapeake Bay during November 1970. The relationship between total length and fecu[illegible] log y = -4.29514 + 3.74418 log x where y is fecundity and x is total length (mm) and between total weight and fecundity is log y = 3.22990 + 1.1157 log x where y is fecundity and x is total weight (g). Gonadal condition was described statistically and histologically. Specimens migrating from Chesapeake Bay are more sexually mature than either American eels migrating from Canadian waters or European eels, A. [illegible]guilla anguilla, migrating from Europe. The significance of these findings with regard to Tucker's hypothesis of European eels being more sexually advanced at the onset of the spawning migration is discussed. (Authors)

18526. Hattingh, J., and A. J. J. Van Pletzen (Dept. of Zool., Rand Afrikaans Univ., Johannesburg, South Africa). 1974. THE INFLUENCE OF CAPTURE AND TRANSPORTATION ON SOME BLOOD PARAMETERS OF FRESH WATER FISH. Comp. Biochem. Physiol., 49(3A): 607-609.

Various blood parameters of the mudfish were studied during the days following capture and transportation. Haemoglobin concentrations, blood pH, osmotic pressures, haematocrit values, red and white blood cell counts, specific gravities and plasma protein values dropped and the water content of plasma and cells, red blood cell fragilities, thrombocyte counts and methaemoglobin concentrations increased within 2-3 days after capture. It is suggested that fish should not be studied too soon after capture and transportation if they are susceptible to these kinds of stress. (Authors)

18527. Savel'yeva, E. A., and L. S. Fedorova (Azov Fish. Res. Inst. (AzNIIRKh), Rostov on Don, USSR). 1973. THE EFFECT OF PITUITARY STIMULATION OF OOCYTE DEVELOPMENT ON MORPHOGENETIC AND METABOLIC PROCESSES IN PIKE-PERCH EMBRYOS [Lucioperca lucioperca (L.)]. J. Ichthyol., 13(6): 854-863.

We studied development of the eggs of the Don pike-perch [Lucioperca lucioperca (L.)] obtained at different times in the spring spawning run and given repeated injections of small doses of the pituitary gonadotrophic hormone, and the effect of pituitary stimulation on morphogenetic and metabolic processes in the embryos. It was established that the viability of progeny obtained from the injected pike-perch spawners was dependent on the initial physiological state of the parents. As the time taken by the females to mature increases the quantity of eggs capable of fertilization decreases. Morphogenesis was found to be similar to morphogenesis in the control in embryos obtained following all injections.

18528. Crossman, John S., and John Cairns, Jr. (Teledyne-Brown Engineering, Huntsville, Alabama). 1974. A COMPARATIVE STUDY BETWEEN TWO DIFFERENT ARTIFICIAL SUBSTRATE SAMPLERS AND REGULAR SAMPLING TECHNIQUES. Hydrobiologia, 44(4): 517-522.

One of the major problems confronting aquatic biologists is locating and sampling ecologically comparable habitats both exposed and not exposed to the variable one wishes to study (e.g. pollutional stress). This not only entails finding areas with comparable physico-chemical characteristics, but should also include sampliability and proximity of sites to each other to provide valid comparative data for proper evaluation of the similarities and differences. One solution to this problem is the use of artificial substrate devices which insure habitat similarity and may be placed where one wishes. (Authors)

18529. Bond, W. A. (Fish. Mgmt. Div., Resource Mgmt. Branch, 501 University Crescent, Winnipeg, Manitoba, Canada). 1974. DATA ON CISCOES, BURBOT AND LONGNOSE SUCKERS FROM GREAT SLAVE LAKE, NORTHWEST TERRITORIES, 1973. Dept. of the Environ., Fish. & Mar. Serv., Data Report Series No. CEN/D-74-3, 44 p.

18530. Tyler, A. V. 1974. USER'S MANUAL FOR PISCES. A GENERAL FISH POPULATION SIMULATOR AND FISHERIES PROGRAM. Environ. Canada, Fish. and Mar. Service Tech. Report No. 480, 29 p. Manuscript status.

A simulation model was developed to link several generally accepted fish-population relationships into a dynamics computer-program that would accept data collected commonly by fishery biologists. The model was written as a series of FORTRAN subroutines that can be called from a main program written by the user. A large computer-system is not necessary for implementation. Population data required are stock-recruitment parameters, maximum growth-rate estimates, estimates of the effect of population size on growth rate, and mortality-rate estimates. One optional subroutine deals with aspects of fish-fry biology: critical densities of zooplankton that are required for feeding, fry-maintenance rations, growth, and survival. Another section of the model allows a fishery to operate. The simulator can be used to study hypothetical combinations, to teach population dynamics, or to evaluate empirical data. (Auth.)

18531. Korovina, V. M., L. I. Lebedeva, and V. P. Prirodina (Ichthyol. Lab., Zool. Inst., USSR Acad. of Sciences and Piscicult. Lab., State Research Inst. for Lake and River Fisheries, (GosNIORKh), Leningrad, USSR). 1973. MORPHOLOGICAL CHARACTERISTICS OF BROAD WHITEFISH X PELYAD [Coregonus nasus (Pallas) X C. peled (Gmelin)] RECIPROCAL HYBRIDS. COMMUNICATION 2. OSTEOLOGICAL COMPARISONS. J. Ichthyol., 13(3): 348-359.

The nature of the manifestation of a number of osteological characters (the shape of some of the bones of the visceral skeleton, the axial skull and the number of vertebrae) has been investigated in adult first generation broad whitefish x pelyad reciprocal interspecific hybrids. Intermediate inheritance of the characters investigated with more or less strongly expressed deviation toward one of the parental species, most often the maternal, is in general characteristic. The matroclinal nature of inheritance may be utilized in practical commercial hybridization. Deviation in the nature of manifestation of the characters was sometimes toward one of the parents in the reciprocal forms; this domination may be taken into consideration in clarification of the generic relations of crossable species.

18532. Wakabayashi, Hisatsugu, and Syuzo Egusa (Dept. of Fish., Univ. of Tokyo, Tokyo, Japan). 1974. CHARACTERISTICS OF MYXOBACTERIA ASSOCIATED WITH SOME FRESHWATER FISH DISEASES IN JAPAN. Bull. Jap. Soc. Sci. Fish., 40(8): 751-757. In English.

Morphological, cultural and biochemical characteristics of 12 cultures of myxobacteria isolated mainly from eels with 'branchionephritis' and cyprinids with 'ulcer disease' were studied. These organisms were gram-negative, slender rods which exhibited gliding motility on agar medium. All cultures were able to grow at 5°, 10°, 20° and 27°C, and tolerated a sodium chloride concentration of 1% for growth. They were uniform in their biochemical properties, though diverse in the production of cytochrome oxidase and in the reduction of nitrate. Some distinguishing features of the organisms were as follows: Degradation of starch, esculin and chitin; utilization of glucose, galactose and citrate; decomposition of tyrosine; nonproduction of hydrogen sulfide; negative reaction to Congo red. They are physiologically similar to the myxobacteria isolated from the American hatchery-raised salmonids with gill disease, tail rot or other myxobacterial infections. The histopathological features of experimentally infected eels resembled those of salmonids with 'hemorrhagic type of gill disease' described by Wood and Yasutake. (Authors)

18533. Cloutman, Donald G., and Larry L. Olmsted (Dept. of Zool., Univ. of Arkansas, Fayetteville, Arkansas 72701). 1974. A SURVEY OF THE FISHES OF THE COSSATOT RIVER IN SOUTHWESTERN ARKANSAS. The Southwestern Naturalist, 19(3): 257-266.

A survey of the fishes of the Cossatot River in southwestern Arkansas produced 53 species representing 13 families. Nine additional species have been reported by others, for a total of 62 species known to occur in the Cossatot River. General distribution and relative abundance of each species are reported. Two specimens of the leopard darter (Percina pantherina) were collected in this survey, representing an eastward extension of the known range for this rare species. (Authors)

18534. Carlson, Anthony R., and Richard E. Siefert (U.S. Environ. Protection Agency, National Water Qual. Lab., Duluth, Minnesota 55804). 1974. EFFECTS OF REDUCED OXYGEN ON THE EMBRYOS AND LARVAE OF LAKE TROUT (Salvelinus namaycush) AND LARGEMOUTH BASS (Micropterus salmoides). J. Fish. Res. Board Can., 31(8): 1393-1396.

At 7 and 10 C lake trout (Salvelinus namaycush) development from fertilization through first feeding was inhibited at all reduced oxygen saturations tested (50% and lower). Survival was adversely affected at all reduced concentrations although only slightly at 50% saturation at 7 C. At 20 and 23 C oxygen concentrations as low as 35% saturation were adequate for largemouth bass (Micropterus salmoides) survival. However, even at the highest reduced oxygen saturation (70%) growth was reduced, and at saturations of 50% and below hatching was premature and first feeding was delayed. (Authors)

18535. Mather, F. J. III, B. J. Rothschild, G. J. Paulik, and W. H. Lenarz (Woods Hole Oceanogr. Inst., Woods Hole, Massachusetts 02543). 1974. ANALYSIS OF MIGRATIONS AND MORTALITY OF BLUEFIN TUNA, Thunnus thynnus, TAGGED IN THE NORTHWESTERN ATLANTIC OCEAN. NOAA Fish. Bull., 72(4): 900-914.

An analysis is presented on the release and return data from bluefin tuna, Thunnus thynnus, tagged in the northwest Atlantic Ocean from 1954 to 1970. There was an apparent northward movement of fish from the New Jersey area as the fishing season progressed. Tag returns from bluefin released in the Long Island and southern New England areas tended to be to the north at first and then to the south. Mean distances between release and return tended to be greater for fish released in the New Jersey area than for the other two areas. Estimates of mortality rates for tagged bluefin were made using the Chapman-Robson method and then adjusted for Type-I and Type-II tag shedding and Type-I tagging mortality. The average estimate of instantaneous fishing mortality is 0.57 and other losses (natural, tagging, and emigration) is 0.68 on an annual basis. The estimate of other losses is considerably higher than the natural mortality that would be expected for bluefin. Evidence is presented suggesting that the rate of emigration may be quite high. The average single season exploitation rate of tagged bluefin was estimated to be 0.33. It was noted that since bluefin may be both immigrating to and emigrating from the fishery the estimate of exploitation may not be representative of the entire population. Even though validity of available effort data is questionable, regression estimates of mortality and survival rates were made using catch per effort data. These estimates of survival are lower than those obtained using the Chapman-Robson method. (Authors)

18536. Soltero, Raymond A., Anthony F. Gasperino, and William G. Graham (Dept. of Biol., Eastern Washington State Coll., Cheney, Wash. 99004). 1974. CHEMICAL AND PHYSICAL CHARACTERISTICS OF A EUTROPHIC RESERVOIR AND ITS TRIBUTARIES: LONG LAKE, WASHINGTON. Water Research, 8(7): 419-431.

Surveillance on the Spokane River and its tributaries has shown that a major source of nutrients influencing the eutrophication of Long Lake was the effluent of the Spokane primary sewage treatment plant. Existing concentrations of nitrate nitrogen and otthophosphate increased threefold and tenfold, respectively, below the effluent. Of the influent phosphate phosphorus, 19 percent was retained in the reservoir. A density current system was evident in Long Lake which altered vertical and longitudinal distribution of physical and chemical parameters. This current isolated a wedge of water on the reservoir bottom which became anaerobic. During the period of anaerobiosis, phosphate phosphorus and nitrogen maxima were present in the hypolimnion. (Authors)

18537. Falk, M. R., D. V. Gillman, and L. W. Dahlke (Lake Mgmt. Section, Fishery Mgmt. Div., Resource Mgmt. Branch, Winnipeg, Manitoba, Canada). 1974. 1973 CREEL CENSUS DATA FROM SPORT FISHING LODGES ON GREAT BEAR AND GREAT SLAVE LAKE, NORTHWEST TERRITORIES. Dept. of the Environ., Fisheries and Marine Service, Data Report Series No. CEN/D-74-5, 28 p.

18538. Nakagawa, Heisuke, and Yasuhiko Tsuchiya (Dept. of Fish., Fac. of Fish. and Anim. Husb., Hiroshima Univ., Fukuyama, Japan). 1974. STUDIES ON RAINBOW TROUT EGG (Salmo gairdnerii irideus). V. FURTHER STUDIES ON THE YOLK PROTEIN DURING EMBRYOGENESIS. J. Fac. Fish. Anim. Husb., Hiroshima Univ., 13(1): 15-27.

The yolk proteins obtained from various stages of embryogenesis of rainbow trout were analyzed in order to determine their chemical and physical properties. The yolk protein gradually changed its physical and chemical properties with the progressing of the embryogenesis. The increase of molecular size of the lipoprotein was observed in the gel filtration. It was suggested that the lipoprotein molecule was rearranged in the yolk sac after a partial degradation by embryo. The amino acid composition of the rainbow trout egg lipoprotein was somewhat similar to that of lipovitellin, although the high value of alanine and the low content of serine, cystine, and tryptophane were characteristic for the former. A decrease in the ratio of several amino acids in the lipoprotein was found from the 42nd day after fertilization. The amino acid composition of glycoprotein in both the unfertilized egg and 42nd-day yolk were similar to each other. Therefore the glycoprotein catabolized without consumption of specific amino acid. (Authors' summ.)

18539. Lange, N. O., and Ye. N. Dmitriyeva (A. N. Severtsov Inst. of Evol. Morphol. and Anim. Ecol., (IEMEZh), Moscow, USSR). 1973. SOME CHARACTERISTICS OF THE EFFECT OF SIMILAR ENVIRONMENTAL FACTORS (MAXIMA OF THE SPRING FLOOD AND THE SPRINGTIME TEMPERATURE REGIME) ON JUVENILE FISHES OF DIFFERENT ECOLOGICAL GROUPS. J. Ichthyol., 13(6): 899-908.

A description is given of the effect of the same factors, namely the maxima of the spring flood and temperature regime, on the abundance of the young of different species of fishes of the Ural River belonging to different ecological groups: asp [Aspius aspius (L.)], bream [Abramis brama (L.)], Caspian roach [Rutilus rutilus caspicus (Jak.)], white-eyed bream [Abramis sapa (Pall.)], sichel [Pelecus cultratus (L.)] and pike-perch [Lucioperca lucioperca (L.)]. The extent of the influence of these factors on the abundance of the species investigated varies in relation to their ecology. The young of species spawning on the river bed are least subject to fluctuations in abundance. The young of fishes spawning in the bank zone of the river and on flooded low lying land are subject to appreciable fluctuations in abundance.

18540. Leyzerovich, Kh. A. (State Res. Inst. for Lake and River Fish. (GosNIORKh), Leningrad, USSR). 1973. DWARF MALES IN HATCHERY PROPAGATION OF THE ATLANTIC [Salmo salar (L.)]. J. Ichthyol., 13(3): 382-392.

In hatchery propagation with rearing in tanks dwarf males of the Atlantic salmon (Salmo salar L.) differ from coeval immature juveniles with respect to a number of morphobiological characteristics, in particular with respect to the dynamics and nature of growth. The relationship between weight increase and length increase is of great importance for the formation of dwarf males. When Fulton's condition factor was high (more than 1.25) the quantity of dwarf males among the young was increased. It has been experimentally shown that once dwarf males have matured they do not convert to the smolt state in most instances, but remature. Mortality is higher among dwarf males than among immature juveniles. We have established the effect of environmental influence on the origin of dwarf males.

18541. Allen, Kenneth O. (Fish and Wildl. Serv., Fish Farming Experimental Sta., Stuttgart, Arkansas 72160). 1974. NOTES ON THE CULTURE OF STRIPED BASS IN TANKS AND SMALL RACEWAYS. Prog. Fish-Cult., 36(1): 60-61.

Striped bass (Morone saxatilis) reared on pelleted feed in circular tanks and small rectangular raceways exhibited good growth, survival, and feed conversion during their first and second growing seasons. Growth was good at temperatures between 22°C and 30°C using both well water and water recycled through a reservoir. Growth decreased when water temperatures exceeded 30°C. Myxobacterial infections were a frequent problem during the first growing season, but not during the second. Combiotic® applied to the water for the control of myxobacteriosis was the most effective chemotherapeutic agent tested. The incidence of infection decreased as water temperatures decreased below 24°C.

18542. Malevski, Y., J. H. Wales, and M. W. Montgomery (Dept. of Food Sci. and Technol., Oregon State Univ., Corvallis, Oregon 97331). 1974. LIVER DAMAGE IN RAINBOW TROUT (Salmo gairdneri) FED CYCLOPROPENOID FATTY ACIDS. J. Fish. Res. Board Can., 31(8): 1397-1400.

Histological changes in livers of rainbow trout (Salmo gairdneri) repeatedly fed diets containing cyclopropenoid fatty acids (CPFA) revealed that these fish were unable to develop resistance to liver damage caused by CPFA. One group of trout was fed 150 ppm CPFA in the basal diet for 49 days followed by the basal diet for the remainder of the experimental period. Another group of trout was fed 150 ppm CPFA for 49 days, basal diet for 65 days, and 150 ppm CPFA for 45 days. At this time this group was divided into two subgroups; one received basal diet for 15 days, the other for 30 days, after which both subgroups were placed on a diet containing 360 ppm CPFA for 36 days. Analysis of the livers for histological changes showed that the parenchymal cells underwent cyclic changes of injury and recovery each time the trout were fed CPFA. Complete recovery of parenchymal cells occurred after the fish were removed from the diets containing CPFA for 30 days. Bile ducts and blood vessel hyperplasia was observed for as long as 7 mo after CPFA was eliminated from the trout diet. (Authors)

18543. Halliday, M. M. 1974. STUDIES ON Myxosoma cerebralis, A PARASITE OF SALMONIDS. IV. A PRELIMINARY IMMUNOFLUORESCENT INVESTIGATION OF THE SPORES OF Myxosoma cerebralis. Nordisk Veterinaermedicin 26: 173-179; Fish Health News, 3(4): p. 11.

By means of the indirect fluorescent antibody technique antibodies were detected in a rabbit inoculated with M. cerebralis spores. However, no antibodies could be detected in rainbow trout either naturally infected or inoculated with spores. Thus this technique could not be used for the diagnosis of whirling disease.

18544. Imura, Koji (Maruho Co., Ltd., Oyodo Kenkyusho, Oyodo-cho, Oyodo-ku, Osaka, Japan). 1974. PURIFICATION AND PROPERTIES OF THE PHOSPHODIESTERASE IN THE PYLORIC CAECA OF RAINBOW TROUT. Bull. Jap. Soc. Sci. Fish., 40(8): 807-814. In Japanese.

The phosphodiesterase in the pyloric caeca of rainbow trout was purified about 260-fold to investigate the role of the enzyme in the digestive organ. The optimum pH for the enzyme activity was approximately 9.0. This enzyme was activated by Mg^{2+} and Ca^{2+} and hydrolyzed RNA forming 5'-mononucleotides. However, the RNA hydrolyzing activity of the enzyme was much lower than that of alkaline RNase in the same tissue. In this enzyme preparation, 2':3' cyclic nucleotide 2'-phosphohydrolase activity was observed and the heat denaturation curve of this activity corresponded with that of the phosphodiesterase activity. From this fact, it is probable that this purified enzyme has both phosphodiesterase and 2':3' cyclic nucleotide 2'-phosphohydrolase activity. The role of this enzyme in the digestive organ may be the cleavage of 2':3' cyclic nucleotides, which are the products of the RNA digestion by alkaline RNase, forming 3'-nucleotides.

18545. Lukina, O. V. (Dept. of Embryology and Histology, Vladivostok Medical Inst., USSR). 1973. RESPIRATORY RATE OF THE NORTH OKHOTSK CHUM SALMON [Oncorhynchus keta (Walb.)]. J. Ichthyol., 13(3): 425-430.

We investigated the respiratory rate of the North Okhotsk chum salmon [Oncorhynchus keta (Walb.)] in different development stanzas and the nature of the variation in oxygen uptake; explanations are given for these variations. It has been established as a general feature that the oxygen consumption of the chum gradually rises in each successive development stage, which is due to continuous growth and to complication of the processes of morphological differentiation and intensification of the growth of the embryos. The increase in the respiratory rate at periods of morphological differentiation is treated as an adaptive property of the organism. The respiratory rate increases during the period when circulation begins and gill respiration develops as a result of the development of the organ systems and intensification of their functions. The increase in oxygen consumption during the period of hatching and during the larval period is connected with the development of the respiratory organs and with the change of respiration.

18546. Oguri, Mikio (Fish. Lab., Fac. of Agric. Nagoya Univ., Nagoya, Japan). 1974. ON THE PITUITARY REMNANT IN "COBALT" VARIANT OF RAINBOW TROUT. Bull. Jap. Soc. Sci. Fish, 40(9): 869-875.

Histological investigations were made to clarify whether the pituitary gland was completely absent in the "cobalt" variant of rainbow trout and the following results were obtained: The pituitary remnant adherent to the base of the brain was detected in three fishes among nine examined. The other six fishes were devoid of the remnant. In all the fishes investigated, the detached pituitary remnant was found, located in the region ventral to the optic chiasma and dorsal to the upper pharynx. The detached remnant was mostly composed of follicular cells. These follicular cells suggest the secretion of prolactin, because the cells are similar in their histological appearance to the prolactin cells of the normal pituitary gland in rainbow trout.

18547. Jones, D. R., J. W. Kiceniuk, and O. S. Bamford (Dept. of Zool., The Univ. of Brit. Columbia, Vancouver, British Columbia V6T 1W5, Canada). 1974. EVALUATION OF THE SWIMMING PERFORMANCE OF SEVERAL FISH SPECIES FROM THE MACKENZIE RIVER. J. Fish. Res. Board Can., 31(10): 1641-1647.

Critical velocities of 17 species of fish from the Mackenzie River have been determined from increasing velocity tests in both field and laboratory, and the effects on critical velocity of different acclimation temperatures and of temperature shock were examined. In five species the relation between fatigue time and swimming speed was investigated. Critical velocity data from 10 species were analyzed by solving the regression equation $V = KL^e$ (where V = critical velocity in cm/s, L = fork length, K = constant, e = exponent). Neither acclimation to different temperatures nor temperature shock over a range of $\pm$ 7 C from acclimation temperature had a significant effect on critical velocity. Intraspecific variation was found to be unrelated to maturity, sex, or condition factor. From a graphical presentation of body length vs. maximum flow rate allowable in a 100-m culvert, it appears that culvert flow rates should be kept below 30-40 cm/s to allow successful passage of the majority of mature individuals of migratory species. (Authors)

18548. Beitinger, Thomas L. (Lab. of Limnol., Dept. of Zool., Univ. of Wisconsin, Madison, Wisconsin 53706). 1974. THERMOREGULATORY BEHAVIOR AND DIEL ACTIVITY PATTERNS OF BLUEGILL, Lepomis macrochirus, FOLLOWING THERMAL SHOCK. NOAA Fish. Bull., 72(3): 1087-1093.

Individual bluegill were allowed to thermoregulate for 3 days in a temperature-preference apparatus and then were exposed for 30 min to one of three temperature treatments: 21.0°, 31.0°, or 36.1°C. Fish exposed to 31°C served as controls for handling procedures. Thermoregulatory performance of surviving fish was monitored for an additional 3 days. Pretreatment results indicated mean lower and upper avoidance temperatures of 29.3° and 33.1°, and 31.2°C as the midpoint of the preferred range. All 20 fish exposed to 21° and 31°C survived treatment and demonstrated no significant differences between pretreatment and posttreatment thermoregulatory performance. Thirty-five percent of fish (7 of 20) exposed to 36.1°C died during treatment. Fish surviving the 36.1°C treatment retained the ability to thermoregulate; however, their mean lower and upper avoidance temperatures increased 0.6° and 0.7°C respectively. Activity patterns were typically diurnal, but variable, in all three treatment groups. Immediately after treatment, the activity of fish exposed to 21° and 36.1°C was markedly decreased. Thereafter, activity tended to be higher in the 21°C group and lower in the 36.1°C group than during the pretreatment period. (Auth.)

18549. Taylor, Robert E. L., and Meryl H. Haber (Anim. Sci. Dept., Univ. of Nevada, Reno, Nevada 89507). 1974. OPERCULAR CYST FORMATION IN TROUT INFECTED WITH Myxosoma cerebralis. J. Wildl. Dis., 10(4): 347-351.

External opercular cysts were observed in cutthroat trout, Salmo clarki henshawii affected with whirling disease. Microscopic examination of the cysts revealed numerous spores of Myxosoma cerebralis in their lumen and walls. Rupture of these cysts may provide a method of whirling disease transmission from live infected fish. (Authors)

18550. Hirose, Keiji. 1973. HORMONAL CONTROL OF FISH OVULATION. Bull. Tokai Reg. Fish. Res. Lab., No. 74, pp. 67-81. In Japanese.

There have been several reviews on gonadal maturation and ovulation in teleosts. These indicate that pituitary and chorionic gonadotropins promote maturation and ovulation in oocytes. However, detailed studies of fish ovulation have not been made. There are many unsolved problems such as knowledge of the way to know maturation stage of ovary at initial in the experiment, preparation of purified fish gonadotropin, and elucidation of handling effects on mature fish for a clarification of the hormonal control of ovulation. The elucidation of these difficult problems may provide a solution to the practical problem of regulatory ovulation necessary for promoting artificial propagation in fish. This review describes mainly experimental results on in vitro ovulation of Oryzias latipes oocytes. A simple system using the techniques of tissue culture was employed in order to ascertain a mechanism of ovulation in fish. Among the various gonadotropins, salmon gonadotropin gave the best response in inducing in vitro ovulation of Oryzias oocytes. The most effective dose of salmon gonadotropin was 0.4 μg/ml. The gonadotropin demonstrated a higher potency than that of mammalian gonadotropin, suggesting zoological specificity. Among steroids, cortisol was very effective in inducing in vitro ovulation of Oryzias oocytes. Furthermore, ovulation in Oryzias latipes appears to be controlled by both the pituitary-ovary and pituitary-interrenal-ovary systems. The latter system has already been described in the catfish by Sundararaj and Goswami (1969). In the pituitary-ovary system, the present author has indicated that ovulation cannot be induced in Oryzias oocytes dissected from their follicular tissues prior to expose to gonadotropin, suggesting the possibility that the hormone acts first on the tissues to produce effective agents (corticoids?) which in turn are responsible for ovulation. Recently, the present author suggested that in mature fish corticoids may be produced from the follicular tissues. Application of a specific inhibitor (SU-4885) of 11 β-hydroxylase resulted in inhibition of gonadotropin-induced ovulation, but did not affect ovulation induced by cortisol. This result suggests that corticosteroidogenesis in the follicular tissues is required for gonadotropin-induced ovulation and the corticoid may be a terminal hormone in fish ovulation. Cortisol cannot induce in vitro ovulation of Oryzias oocytes removed from their follicles. Therefore, ovulation which is instigated by the pituitary-ovary system in Oryzias latipes may be induced by some sort of effective secondary substance which is produced during corticoid biosynthesis or metabolism within the follicular envelope, when such is activated by addition of gonadotropin. Recently, the present author has shown that gonadotropin-treated ayu imbibes a significantly greater quantity of water than in the control fish and that the body weight increases by 3% in the hormone-treated fish, whereas it decreases by 3% in the control due to starvation. These results indicate that water ingestion and hydration of oocytes by the gonadotropin treatment may be important process in ovulation. Furthermore, it is indicated that during maturation and ovulation the hydration of oocytes occurs with ion movement (Na^+). Gonadotropin may exert its initial effect on the oocyte surface, possibly acting on the sodium and potassium transport system or the passive permeability of the egg membrane. Such information may yield further clues regarding the mechanism of fish ovulation with special respect to water and ion balance. Thus ion balance appears to be influenced by handling, transport of fish, etc. These fundamental results mentioned here must be applied in the practical techniques of maturation and ovulation in the artificial propagation of fish.

18551. Guerrero, Rafael D. III, and William L. Shelton (Dept. of Fish. and Allied Aquacult., Auburn Univ., Agric. Exp. Sta., Auburn, Alabama 36830). 1974. AN ACETO-CARMINE SQUASH METHOD FOR SEXING JUVENILE FISHES. Prog. Fish-Cult., 36(1): 56.

A squash method using aceto-carmine stain for determining sex of immature fishes by gonadal examination is described. The method has worked with Tilapia aurea as small as 25 mm SL and Lepomis macrochirus, 29 mm SL. It can be applied for sexing fresh specimens or preserved ones in alcohol or formalin. Sexing of mature individuals with regressed gonads during certain seasons is another possible application. (Authors)

18552. Bennett, George W. 1974. ECOLOGY AND MANAGEMENT OF LARGEMOUTH BASS, Micropterus salmoides. In: Symposium on Overharvest and Management of Largemouth Bass in Small Impoundments. N. C. Div. Amer. Fish. Soc., Spec. Pub. 3:10-17.

Total numbers of largemouth bass removed from Ridge Lake over the past 30 years were 35,400 weighing 10,200 lb. These fish were taken by fishermen and in draining censuses after which only the larger fish were restocked. No additional bass have been stocked since the original release of 100 adults and 335 yearlings in 1941. In 10 draining censuses during the 30-year period the bass population has ranged in numbers between 1,500 and 6,000. In spite of annual exploitation rates as high as 60%, bass were capable of replacing their numbers and weights during a single season. Small numbers of large fish were always present in spite of no restrictions on lengths or numbers of bass that may be taken by fishermen. (Auth.)

18553. Ayles, G. Burton (Dept. of Zool., Univ. of Toronto, Toronto, Ontario, Canada). 1974. RELATIVE IMPORTANCE OF ADDITIVE GENETIC AND MATERNAL SOURCES OF VARIATION IN EARLY SURVIVAL OF YOUNG SPLAKE HYBRIDS (Salvelinus fontinalis X S. namaycush). J. Fish. Res. Board Can., 31(9): 1499-1502.

Additive genetic and maternal effects of survival of uneyed eggs, eyed eggs, and alevins were determined from five series of matings within a splake brood stock. Average values for family h^2 (heritability) and family m (maternal variance/total variance) were estimated. There were additive genetic effects in alevin survival ($h^2 = .41 \pm .18$) but not in uneyed or eyed egg survival. Maternal effects were greatest within the uneyed stage ($m = .78 \pm .22$), decreased furing the eyed egg stage ($m = .68 \pm .24$), and were least within the alevin stage ($.40 \pm .19$). The additive genetic effect on alevin survival was attributable to genetic differences in the resistance of young splake to blue sac disease ($h^2 = .76 \pm .28$). (Auth.)

18554. Hanson, Lee H., Everett Louis King, Jr., John H. Howell, and Allen J. Smith (U.S. Fish & Wildl. Serv., Hammond Bay Biol. Sta., Millersburg, Michigan 49759). 1974. A CULTURE METHOD FOR SEA LAMPREY LARVAE. Prog. Fish-Cult., 36(3): 122-128.

A laboratory method for raising sea lamprey (Petromyzon marinus) larvae from fertilized eggs is presented. The effects of type of food, feeding rate, stocking density, and temperature were examined. Moist yeast cake proved to be a satisfactory food for the larvae. Over 600 larvae per square meter were raised to an average length of approximately 50 mm in 1 year by adding 105 g of moist yeast cake per square meter of bottom area twice each week. Moist yeast cake was more efficient than dry yeast in promoting growth and survival of the larvae. Increased stocking densities and low water temperatures reduced growth and survival rates. (Authors)

18555. Schroeder, Gerald L. (Fish and Aquacult. Res. Sta., Dor, Israel). 1974. USE OF FLUID COWSHED MANURE IN FISH PONDS. Bamidgeh, 26(3): 84-96.

Manure is often used as a fertilizer for fish ponds. The decay of the manure in the pond consumes dissolved oxygen (D.O.) and can lower the D.O. to a level at which fish kill by anoxia occurs. To determine the effects of fluid cowshed manure on fish ponds, the cycles of D.O., abundance and protein content of natural foods, and fish growth were studied in a group of ponds receiving varied amounts of manure. The manure was analysed for 1 day and 5 day biological oxygen demand (BOD_1, BOD_5) at pond temperature, chemical oxygen demand (COD), and percent dry matter. No foods or fertilizers other than manure were added to the ponds. Determining BOD_1 of the manure at pond temperature consistently allowed prediction of the maximum amount of oxygen that decay of manure would use and the maximum overnight reduction of D.O. in the pond water due to the added manure. This permitted calculation of the amount of manure able to be added to a pond without hazard of causing anoxia. For a given source of manure, the percent of dry matter was a fair indicator of BOD_1. Abundance of natural foods (zooplankton and chironomides) was greater in ponds receiving manure than in non-manured ponds. The zooplankton had a 56% protein content on a dry weight basis. For rates of about 5,000 fish per hectare preliminary data indicate that growth of carp was 25% to 100% faster in manured

ponds than in non-manured ponds. With no supplemental food, in manured ponds, carp stocked at 18 gm averaged a growth rate of 3.3 gm/day for 40 days during the summer. Carp stocked at 180 gm averaged a growth of 4.0 gm/day during March. (Auth.)

18556. DiNardi, S. R., K. S. Wisnieski, and E. C. MacDonald (Massachusetts Univ., Amherst, Massachusetts). 1974. MERCURY CONCENTRATIONS IN TISSUES OF FISH FROM THE CONNECTICUT RIVER. J. Environ. Health, 36(6): 547-551; Selected Water Resources Abstracts, 7(22): p. 44.

The purpose was to evaluate the threat of mercury to fish and to man by determining mercury concentrations of five common species of fish from the Connecticut River; to see if species sampled meet the Food and Drug Administration (FDA) limit of 0.500 ppm of mercury in fish; to find a species that may serve as an index of mercury pollution for surveillance purposes; and to determine if significant differences of mercury occur among the species and tissue sites within species. The five species tested were the American shad, Pumpkinseed, Yellow Perch, Smallmouth Bass, and White Sucker with Rainbow Trout serving as the control. It was concluded that: (1) the quantity of mercury in these species of fish in the Connecticut River currently is not a threat to man; (2) all fish tested were within the FDA standard. The highest sample mean was 0.186 ppm (White Sucker) and the highest individual portion of 0.283; (3) the White Sucker, with the highest average concentration, will serve as an index species; (4) this experiment emphasized the importance of taking portions from three axial muscle sites to obtain more stable determinations. When single portions or several portions from one axial muscle site were tested, there were wide variations in results.

18557. Vil'yamar, A. (Dept. of Ichthyol., Moscow Univ., Moscow, USSR). 1973. AGE DETERMINATION IN FISHES OF THE FAMILY SCIAENIDAE. J. Ichthyol., 13(4): 550-561.

An account is given of the results of age determination by scales and otoliths in tropical and subtropical species of the family Sciaenidae from different regions of the seas and oceans. It is noted that the shape of the scales is similar in members of different species and genera. Annuli are well distinguishable on the scales of the subtropical species Argyrosomus argentatus (Houttuyn), Nibea mitsukurii (Jordan et Snyder), Cynoscion parvipinnis Ayres and Umbrina cirrosa L. Difficulties are encountered in the detection of annuli in the tropical species Pentheroscion mbizi (Poll) and Pseudotolithus (Fonticulus) elongatus (Bowdich). Description of the otolith characters of several genera may serve to discriminate genera of the family Sciaenidae. Clearly apparent annual zones are detectable on sections of the otoliths of N. mitsukurii and A. argentatus; they form at different times in relation to membership of a particular population. An attempt is made to evaluate published data on age determination in fishes of the family Sciaenidae.

18558. Lane, E. D. (Biol. Dept., Calif. State Univ., Long Beach, California 90840). 1974. AN IMPROVED METHOD OF SURBER SAMPLING FOR BOTTOM AND DRIFT FAUNA IN SMALL STREAMS. Prog. Fish-Cult., 36(1): 20-22.

Modifications to the Surber stream sampler are described. These are a finer mesh escapement net to measure escapement of small insects from the Surber and the addition of catch bottles to both the Surber and escapement nets. The latter greatly simplifies use at night and in freezing conditions. Construction is figured and described. (Auth.)

18559. Murtaugh, Patricia A., John E. Halver, Marc S. Lewis, and Jules A. Gladner (Western Fish Nutrition Labs, U.S. Fish & Wildl. Serv., Dept. of the Interior, Cook, Washington 98605). 1974. CROSS-LINKING REACTIONS OF LAMPREY FIBRINOGEN AND FIBRIN. Biochimica et Biophysica Acta, 359, pp. 415-420.

Lamprey plasma possesses an unusual fibrinogen in that the α-chain(s), in contrast to other species reported to date, appear to be more than twice the molecular weight of the γ-chain(s). Upon the addition of the necessary concomitants, one can demonstrate the existence of the cross-linking transglutaminase-type enzyme, Factor XIII. (Authors)

18560. Nichols, Stanley A. 1974. MECHANICAL AND HABITAT MANIPULATION FOR AQUATIC PLANT MANAGEMENT. A REVIEW OF TECHNIQUES. Dept. of Natural Resources, Madison, Wisconsin, Tech. Bull. 77, 34 p. illus.

Harvesting and habitat manipulation techniques, along with the requisite biology and planning, are reviewed with regard to managing nuisance aquatic plant growths. Harvesting has beneficial ecological implications as it removes the problem biomass from the water and its cost and effectiveness have the same magnitude and variability in results as does chemical treatment with herbicides. Habitat manipulation involves a somewhat broader array of management techniques and includes shading with dyes and black sheeting, dredging, sand or gravel blanketing, overwinter drawdown, and nutrient limitation. Of these techniques overwinter drawdown, dredging to a depth below the photic zone, and shading with black plastic sheeting appear to be effective treatments. Sand and gravel blanketing show initially encouraging but short-lived results. The results of dyes, and nutrient limitation, yield rather inconclusive results. (Auth.)

18561. Bulkley, R. V., L. R. Shannon, and R. L. Kellogg (Iowa Coop. Fish. Res. Unit, Ames, Iowa). 1974. CONTAMINATION OF CHANNEL CATFISH WITH DIELDRIN FROM AGRICULTURAL RUNOFF. Completion Report Iowa Water Resources Research Inst., No. 62, 144 p., available from NTIS, Springfield, Va. 22161 as PB-236 416 $5.75 paper copy, $2.25 in microfiche; Selected Water Resources Abstracts, 7(24): p. 68.

Dieldrin concentrations in Des Moines River water measured from April to October ranged from 1 to 50 ng/liter during 1971-1973. Peak concentrations in river water usually followed within a month after corn planting season. Dieldrin levels in aquatic insects and minnows sampled in 1973 were highest in June, decreased in the summer and increased to higher levels in autumn. Dieldrin levels in catfish muscle varied significantly with size and age of fish but not with amount of muscle fat. Annual and seasonal trends in dieldrin levels in catfish muscle were not consistent for different length groups except that peak levels most frequently occurred in July each year. Biomagnification of dieldrin from catfish food organisms to catfish muscle was not evident. Twenty-eight day exposure to 75 ng/liter dieldrin in water resulted in 14-16 in. catfish accumulating more dieldrin in muscle than did 6-9 in. fish. After elimination for 28 days, dieldrin levels in both size groups were nearly equal. When fish were exposed in both food and water, dieldrin from both sources contributed to the total muscle concentration. Large catfish accumulated more dieldrin from food and water than did small catfish but eliminated dieldrin at a similar rate after exposure ceased.

18562. Lewis, Gerald E. (West Virginia Dept. of Nat. Res., Romney, West Va. 26757). 1974. OBSERVATIONS ON THE CHAIN PICKEREL IN WEST VIRGINIA. Prog. Fish-Cult., 36(1): 33-37.

Chain pickerel (Esox niger) occur as fishable populations in four West Virginia streams. A total of 154 pickerel were collected in this study from Patterson Creek, in Mineral County. Ripe females were collected when water temperatures ranged from 51°F (11°C) to 55°F (13°C). Ripe males were collected over a longer period than females. The spawning of 2-year-old females was verified. Small pickerel fed mainly on insects and vertebrates became increasingly important in the diet of larger pickerel. Fish were eaten by pickerel in the order of their abundance. The body-scale relationship was best described as a straight line. The formation of a winter annulus was validated on four specimens that were released and later recaptured. Growth calculated by the proportion method gave a better approximation of the calculated growth than did the regression method. Otoliths were removed from 100 fish and a resulting correlation coefficient of 0.987 was found to exist between otolith diameter and body length. The determination of annuli from chain pickerel otoliths does not appear practical. The weight of females at a given length was not found to differ significantly from the weight of males at a corresponding length. When converting total length to fork length, the factor 0.928 can be used. The ratio 1.078 is applicable when converting fork length to total length. (Auth.)

18563. Boyce, F. M. (Lakes Res. Div., Canada Centre for Inland Waters, Burlington, Ontario, L7R 4A6, Canada). 1974. MIXING WITHIN EXPERIMENTAL ENCLOSURES: A CAUTIONARY NOTE ON THE LIMNOCORRAL. J. Fish. Res. Board Can., 31(8): 1400-1405.

A simple theoretical model was constructed to simulate heat transfer from a stratified lake surrounding an experimental enclosure constructed of a thin, flexible, vertical curtain. It was shown that for realistic dimensions of the apparatus and for modest horizontal turbulent diffusion processes within the enclosure, the vertical temperature profiles inside and outside the enclosure could be expected to be closely similar, and that the similarity was a result of horizontal heat transfers. In this situation, similarity of temperature profiles was not evidence of similarity of vertical transfer processes and experimental results within enclosures which depend on vertical transfers should be extrapolated with caution to the main body of the lake. (Auth.)

18564. Panov, D. A., L. G. Motenkova, and V. G. Chertikhin (All-Union Pond Fisheries Res. Inst. (VNIIPRKh), Settlement of Rybnyy, Moscow Province, USSR). 1973. FACTORS INFLUENCING PREDATION BY JUVENILE CARP [Cyprinus carpio (L.)] ON THE YOUNG OF PHYTOPHAGOUS FISHES IN JOINT CULTIVATION (EXPERIMENTAL STUDIES.) J. Ichthyol., 13(6): 915-920.

When juvenile fishes are reared in polyculture increased losses of the larvae of phytophagous fishes are observed when they are placed in ponds previously stocked with carp. This suggests that juvenile carp are capable of transferring to predatory feeding when invertebrates are in short supply. It has been experimentally established that the carp may begin to feed on fish on reaching stanza D_2 of the larval development period. The conditions for this transition are defined: the size ratio of the carp and the phytophagous fishes, and also the zooplankton concentrations at which the carp is obliged to transfer to a fish diet.

18565. Hazdra, J. J., E. R. Brown, J. Baudendistel, T. Arndt, and L. Keith (Illinois Benedictine Coll., Lisle, Illinois). 1974. CARCINOGENIC SOURCES IN FISH TUMORS FOUND IN THE FOX VALLEY WATERSHED. In: Preprints of Papers Presented at the 167th National Meeting of the Amer. Chem. Soc., April 1-5, 1974, Los Angeles, Calif.: Amer. Chem. Soc., Div. of Environ. Chem., 14(1): 350-355; Selected Water Resources Abstracts, 7(21): p. 45.

The fish populating the polluted Fox River system of Illinois have a higher frequency of tumors than the same species present in non-polluted Canadian rivers. The frequency was higher from May to October. This seems to correspond to the seasonal bacterial variation in pollution and bacterial count. The main variation in the 2 sites is the chemical nature of the water. As water pollution increased there is a corresponding increase in neoplastic disease in the fish population.

18566. Adams, Evelyn S., and Frederick G. Towle (Univ. of New Hampshire and Maine Salmon Farms, Durham, New Hampshire 03824). 1974. USE OF A RECOMPRESSION CHAMBER TO ALLEVIATE GAS-BUBBLE DISEASE IN COHO SAC-FRY. Prog. Fish-Cult., 36(1): p. 41.

Coho salmon sac-fry suffering from gas-bubble disease were placed in a recompression chamber. The fish were taken down to 165 feet at a rate of 10 ft/min. At 100 ft all symptoms disappeared. A 2-1/2-h ascent proved too rapid for most fish. A longer saturation schedule is suggested. (Authors)

18567. Cushing, D. H. (Min. of Agric. Fish. and Food, Fisheries Lab., Lowestoft, Suffolk, United Kingdom). 1974. A LINK BETWEEN SCIENCE AND MANAGEMENT IN FISHERIES. NOAA Fish. Bull., 42(4): 859-864.

In this paper a link is traced between science and management in that good conservation results from good science and that failure in management may be the result of scientific failure; but management failure is, of course, not the exclusive province of scientists. The argument is developed from a historical study of practice by fisheries scientists in the International Commissions. (Auth.)

18568. Sanford, W. C. (Okla. State Univ., Stillwater, Oklahoma). 1974. EFFECTS OF CADMIUM SALTS ON THE REPRODUCTIVE POTENTIAL OF MALE RAINBOW TROUT AS DETERMINED BY INVIVO AND INVITRO TECHNIQUES. Okla. Water Resources Research Inst., Stillwater Completion Report, 16 p., available from NTIS, Springfield, Va. 22161 as PB-235 837 $3.00 paper copy, $2.25 in microfiche; Selected Water Resources Abstracts, 7(23): p. 48.

A new method for dispersing strongly adhesive cells which uses trypsin and EDTA and ultrasonic sound at non-destructive levels, has been applied to cultures of rainbow trout gonad (RTG-2) cells and has yielded monodisperse cells. Cells dispersed with combined chemical and sonic treatment exhibited the same settling and adhesion times as those transferred without ultrasonic treatment. As measured by trypan blue dye exclusion, viability of cells after this isolation technique was 93%. This new method allows 100% recovery of cells from dense cultures, yields monodisperse cells in suspension, and reduces trypsin contact time. Cadmium chloride was added to Liebovitz L-15 medium to give concentrations of 0, 1, 5 and 10 mg CdCl2/l to determine the effect of Cd on the growth rate and morphology of rainbow trout gonad cells. One mg CdCl2/l had very little effect on the cells with growth rates and morphology equivalent to control cells lacking CdCl2. After 6 days contact with 5 mg CdCl2/l, a depression in growth rate below control levels was observed as well as a morphologic change in cells characterized by decreased substrate adhesion and the formation of thin granular cellular projections. At 10 mg CdCl2/l a rapid loss of cells occurred with a loss of cellular integrity.

18569. Epler, Piotr, and Krzysztof Bieniarz (Akademia Rolnicza w Krakowie, Inst. Zool. Stosowanej, Poland). 1974. RESULTS OF EXPERIMENT ON LETTING THE TAGGED LAKE TROUT - Salmo trutta morpha lacustris (Linnaeus, 1758) INTO THE DUNAJEC RIVER. (Wyniki Wpuszczenia Znakowanej Troci Jeziorowej - Salmo trutta morpha lacustris (Linnaeus, 1758) do Dunajca). Roczniki Nauk Rolniczych, 96(2): 37-46. In Polish with English synopsis and summary.

The results of letting the tagged lake trout into the Dunajec River were investigated. The fish were let into the river upstream from the dam reservoirs Roznow and Czchow. The lake trout was found to migrate to the Baltic Sea and not to stop in the dam reservoirs. The majority of tags sent back to the laboratory were from the lake trout caught in the vicinity of the Vistula River mouth, in the waters of Gdansk Bay and near the coast of the Lithuanian SSR. (Authors' synopsis).

18570. Nose, Takeshi, Shigeru Arai, Dong-Liang Lee, and Yoshiro Hashimoto (Freshwater Fish. Res. Lab., Hino, Tokyo, Japan). 1974. A NOTE ON AMINO ACIDS ESSENTIAL FOR GROWTH OF YOUNG CARP. Bull. Jap. Soc. Sci. Fish., 40(9): 903-908.

Young carp, Cyprinus carpio, were found to grow to some extent on an amino acid test diet neutralized with NaOH, but only a little on a diet not neutralized. Thirty five fish were grouped in each aquarium and fed ad libitum the test diet adjusted to pH 6.5 - 6.7 for a period of 6 weeks. The fish fed diets deficient in each of alanine, aspartic acid, cystine, glutamic acid, glycine, proline, tyrosine and serine grew as well as those fed the complete diet. The fish fed diets deficient in each of arginine, histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan and valine failed to grow until the deleted amino acid was returned to the ration. It was thus postulated that carp require the same ten kinds of amino acid reported to be essential for other fishes.

18571. Lahav, M., and S. Sarig (Lab. for Res. of Fish Diseases, Nir-David, Israel). 1973. OBSERVATION OF LABORATORY INFECTION OF CARP BY Ichthyophthirius multifiliis Foquet. Bamidgeh, 25(1): 3-9.

It is possible to obtain in controlled laboratory conditions the infestation and reinfestation of carp with Ichthyophthirius multifiliis. Temperature governs the length of the life-cycle and of the size of the parasite. A great variation was found in the length of the life-cycle and in the intensity of infestation in different experiments under similar conditions. (Authors' summ.)

18572. Yocom, Thomas G., and Thomas A. Edsall (U.S. Fish & Wildl. Serv., Great Lakes Fish. Lab., Ann Arbor, Michigan 48107). 1974. EFFECT OF ACCLIMATION TEMPERATURE AND HEAT SHOCK ON VULNERABILITY OF FRY OF LAKE WHITEFISH (Coregonus clupeaformis) TO PREDATION. J. Fish. Res. Board Can., 31(9): 1503-1506.

Fry of lake whitefish (Coregonus clupeaformis) acclimated to 10, 15, and 18 C were exposed to temperatures of 24.5, 25, and 28 C for 1 min and then immediately returned to water at their acclimation temperature, in test tanks containing yearling yellow perch (Perca flavescens). The number of attacks on the fry and number captured and eaten in 30 min were recorded in separate tests of shocked and unshocked (control) whitefish. Significantly more whitefish were captured per attack (data for shocked and unshocked fry combined) at 15 and 18 C than at 10 C; and shocked fry were significantly more vulnerable to capture by the perch than were unshocked controls. (Authors)

18573. Tackett, Dewey L. (U.S. Fish & Wildl. Serv., Fish Farming Exp. Station, Stuttgart, Arkansas 72160). 1974. YIELD OF CHANNEL CATFISH AND COMPOSITION OF EFFLUENTS FROM SHALLOW-WATER RACEWAYS. Prog. Fish-Cult., 36(1): 46-48.

A yield of 120 kg/m^3 (7.5 lb/ft^3) of marketable channel catfish was produced in an experimental raceway system having 0.34 m^3 (12 ft^3) of water volume, a water depth of 23 cm (9 in.), and an inflow of 23 l/min (6 gal/min). Stocking size and density determined the average weight of the fish at harvest. The prediction equation was: $Y = 1.053x_1 - 2.724x_2 + 520.284$ where Y equals average weight in grams, x_1 is stocking size in grams, and x_2 is number of fish stocked per raceway. The concentration of chemical constituents in the influent and effluent differed significantly only in suspended solids and BOD. (Auth.)

18574. Whitworth, W. R. (Inst. of Water Resources, Connecticut Univ., Storrs, Connecticut). 1974. EFFECTS OF SIMULTANEOUS VARIATIONS OF DIEL CHANGES OF TEMPERATURE, DISSOLVED OXYGEN, SALINITY, AND A POLLUTANT ON THE GROWTH OF WHITE CATFISH. Completion Report, OWRT A-036-CONN(1), 5 p.; Selected Water Resources Abstracts, 7(23): p. 75.

Three long-term bioassays (8, 79 and 156 days) were performed in closed growth chambers with continuous waterflow to determine the growth and mortality responses of white catfish (Ictalurus catus L.) exposed to 2 diurnally fluctuating temperature and oxygen ranges and 3 diurnally fluctuating dissolved aluminum as alum (A12 (SO4)3.14H20) and sodium chloride levels. One long-term bioassay (242 day) was performed in open tanks to determine growth responses of white catfish to 2 diurnally fluctuating temperature ranges and 2 diurnally fluctuating dissolved aluminum (as alum) and sodium chloride levels. Short-term bioassays (24, 48 and 96 hours) were performed on 8 species of freshwater and estuarine fishes and the stability of alum solutions was measured. Reduced growth rates and mean weights were exhibited by white catfish exposed to the highest fluctuating levels of temperature, oxygen, aluminum and sodium chloride. Eight species of fish had 96-hour TLM's (concentration at which 50% of the specimens would die) of 8.0 to 21.9 mg/liter Al. Aluminum solutions (15 and 50 mg/liter) were reduced at rates of 0.21 to .271 and .104 to .167 mg/liter/hr.

18575. Rowe-Rowe, D. T. (Natal Parks Board, P.O. Box 662, Pietermaritzburg, Natal, South Africa). 1974. REACTION TIMES OF CERTAIN FRESHWATER FISHES TO A ROTENONE-CONTAINING PISCICIDE. J. Sth. Afr. Wildl. Mgmt Assoc. 3(1): 16-18.

The reaction times (loss of equilibrium) for certain freshwater fishes were determined in laboratory tests (nine species) and in the field (ten species). Barbasco (6.8 percent rotenone) was used in all tests. Eight of the laboratory species were tested using 0.068 ppm rotenone concentration at approximately 21°C. Field data were obtained from various size fish in water ranging from 13°C to 26°C, and at concentrations of 0.034 to 0.136 ppm rotenone. The reaction time varied with size of fish and temperature of water. (Auth.)

18576. Kelso, John R. M. (Dept. of the Environ., Fish. & Mar. Serv., Great Lakes Biolomnol. Lab., Canada Centre for Inland Waters, Burlington, Ontario L7R 4A6, Canada). 1974. INFLUENCE OF A THERMAL EFFLUENT ON MOVEMENT OF BROWN BULLHEAD (Ictalurus nebulosus) AS DETERMINED BY ULTRASONIC TRACKING. J. Fish. Res. Board Can., 31(9): 1507-1513.

Brown bullhead (Ictalurus nebulosus) were captured between July 31 and August 23, 1973, both within the influence of a thermal discharge in Lake Ontario and at a control site. Ten fish were marked with ultrasonic transmitters and continuously tracked for periods of 29-344 min in the influence of the discharge. Five bullheads from the control site were similarly treated and monitored. Fish caught and released in the discharge area remained within 50-700 m of the release point, turned frequently and sharply, and swam at an average speed of 30 cm/s. Control fish moved along shore, average speed 48 cm/s, in straighter paths up to 4200 m from the release point. On the morning following release, only 20% of fish released in the discharge were still there, indicating that association with the plume was of short duration. The study indicates that the thermal discharge can interrupt or alter normal movement patterns of brown bullhead. (Auth.)

18577. University of Wisconsin-Madison, Water Resources Information Program (1975 Willow Drive, Madison, Wisconsin 53706). 1974. PERMUTED INDEX TO CURRENT EUTROPHICATION LITERATURE. Univ. of Wis.-Madison, 145 p.

This index is based primarily on literature published in 1973 as contained in "Eutrophication: A Bimonthly Summary of Current Literature," issues numbered 31 to 39. It contains a subject reference to pertinent literature in Section I, and an alphabetical listing of authors, the titles of their papers, and their publication sources in Section II.

18578. Nightingale, John W., William K. Hershberger, Patricia Golden, and Glenn A. Yokoyama (Univ. of Wash., Coll. of Fish., Seattle, Washington 98195). 1974. A NEW HATCHERY DATA SYSTEM. Prog. Fish-Cult., 36(1): 61-62.

A new system for recording and storing salmonid spawning and survival data was developed at the University of Washington, College of Fisheries hatchery. All data on each "lot" are recorded on single 5- by 8-inch cards with a printed format. The cards can be used with ease both for recording data in the hatchery and for later retrieval for analyzing results. (Authors)

18579. Borthwick, P. W., G. H. Cook, and J. M. Patrick, Jr. (Environ. Protection Agency, Gulf Breeze Environ. Res. Lab., Gulf Breeze, Florida). 1974. RESIDUES IN FISH, WILDLIFE, AND ESTUARIES. Pesticides Monitoring Journal, 7(3/7); Selected Water Resources Abstracts, 7(24): p. 74.

In June 1972, a collection was taken of estuarine sediments, crabs, shrimps, and fishes, two years after aerial applications of mirex bait for controlling fire ants in coastal regions near Charleston, South Carolina. Previous monitoring (October 1969 to June 1971) determined levels of mirex in animal samples as: crabs, 0-0.60 ppm; shrimps, 0-1.3 ppm; and fishes, 0-0.82 ppm. Mirex was recently shown present in three species of fish (white catfish, 0.021 ppm; bluegill, 0.047 ppm; carp, 0.12 ppm) and blue crabs (0.026 ppm) at freshwater stations. There was no mirex detected in 36 other species examined taken from nine saline stations in the estuaries after a period of restricted pesticide use. No mirex was found at the bottom sediment samples.

18580. Rowe-Rowe, D. T. (Natal Parks Board, P.O. Box 662, Pietermaritzburg, Natal, South Africa). 1974. THE DETOXIFICATION OF TWO ROTENONE-CONTAINING PISCICIDES IN FRESH WATER. J. Sth. Afr. Wildl. Mgmt Assoc. 3(1): 22-23.

The time taken for two rotenone-containing piscicides, Derris (6.5 percent rotenone) and Barbasco (6.8 percent rotenone) to detoxify after application to water is established. In aerated tap water at approximately 21°C the compounds detoxified in five to eight days. Two ponds that were treated detoxified in nine and ten days. Examples are quoted of treated ponds being successfully restocked 17 days after poisoning. (Auth.)

18581. Bonneau, Donald L., and Jerry M. Conley. 1974. A SUMMARY OF LARGEMOUTH BASS MANAGEMENT IN THE MIDWEST. In: Symposium on overharvest and management of largemouth bass in small impoundments. N. C. Div. Amer. Fish. Soc., Spec. Pub. 3: 6-9.

Fisheries administrators of 12 midwestern states and the province of Ontario provided information on largemouth bass fisheries and management. About one-third of the water area supports largemouth bass fisheries. All of the states have definite programs for stocking largemouth bass and suitable forage species in new or renovated waters. All but Ohio limit the daily take of bass to 5 - 10 fish. Five agencies had changed regulations governing the harvest of bass within the past decade and five anticipated changes in the future. Five had made no changes and anticipated none.

18582. Voloshenko, B. B. (State Res. Inst. for Lake and River Fish. (GosNIORKh), Leningrad, USSR). 1973. A COMPARATIVE ANALYSIS OF THE FEEDING OF UNDERYEARLINGS OF THE PELYAD [Coregonus peled (Gmelin)], THE BROAD WHITEFISH [Coregonus nasus (Pallas)] AND THEIR HYBRIDS WHEN REARED TOGETHER. J. Ichthyol., 13(4): 569-576.

A study has been made of the feeding of underyearlings of the pelyad [Coregonus peled (Gmelin)], the broad whitefish [Coregonus nasus (Pallas)] and their reciprocal hybrids reared in ponds. Information is given on the anatomical structure of the mouthparts and the pharyngobranchial apparatus, which determine the nature of feeding in the fishes investigated. It is shown that the hybrid forms obtained by crossing the pelyad with the broad whitefish are capable of utilizing the food supply of ponds more fully, considerably increasing their productivity.

18583. Shrestha, S. B. (Fisheries Development Center, Pokhara (Nepal). 1973. INDUCED BREEDING OF GRASS CARP IN NEPAL. Bamidgeh, 25(1): 10-16.

Grass carp (Ctenopharyngodon idellus Cuv. & Val.) has recently been introduced into Nepal. As this fish did not spawn spontaneously in natural conditions in the ponds, experiments were carried out at Godavari Fish Farm in Nepal to induce breeding for commercial culture of the grass carp. The experiments described show that two consecutive injections of pituitary hormone (to a total of 4.5 mg hormone per kg body weight of the female fish) induced ovulation. The eggs were treated with tannin solution to toughen them enough to resist injuries and bacterial infection during the incubation period. When maintained in plastic and fine mesh cloth bags with a regulated flow of water, the eggs hatched successfully. (Auth.)

18584. Campbell, R. D., T. P. Leadem, and D. E. Johnson (Dept. of Biol., Idaho State Univ., Pocatello, Idaho). 1974. THE IN VIVO EFFECT OF P, P' DDT ON NA+-K+-ACTIVATED ATPASE ACTIVITY IN RAINBOW TROUT (Salmo gairdneri). Bull. Environ. Contamin. Toxicol., 11(5): 425-428; Selected Water Resources Abstracts, 7(22): p. 47.

Trout kept in three different salinities were administered DDT in two different concentrations in order to determine the effect of p, p' DDT on Na+, K+-ATPase activity. A relationship between salinity and a propensity for inhibition of the enzyme activity seemed probable in branchial enzyme activity but not in renal enzyme activity. It may be concluded that DDT is capable of inhibiting Na+, K+-ATPase activities in tissues of chronically exposed rainbow trout. Pesticide-salinity interactions exist which must adapt to waters of different salinities.

18585. Hunn, Joseph B., and John L. Allen (U. S. Fish & Wildl. Serv., Fish Control Lab., La Crosse, Wisconsin 54601). 1974. URINARY EXCRETION OF QUINALDINE BY CHANNEL CATFISH. Prog. Fish-Cult., 36(3): 157-159.

Channel catfish (Ictalurus punctatus) were exposed to the anesthetic quinaldine sulfate in well water at 12°C. Urine collected from these fish during 24 hr of withdrawal in fresh water, contained less than 5% of the total estimated quinaldine residue eliminated. (Authors)

18586. Gordon, Bernard L. (Northeastern Univ., Boston, Mass.). 1974. THE MARINE FISHES OF RHODE ISLAND. The Book & Tackle Shop, Watch Hill, Rhode Island, 136 p., illus.

18587. Anderson, G. B., and D. L. Mitchum (Dept. of Vet. Anatomy, Univ. of Sask., Saskatoon, Saskatchewan). 1974. ATLAS OF TROUT HISTOLOGY. Bull. No. 13, Wyoming Game & Fish Dept., Cheyenne, Wyoming 82002, 110 p., illus. $4.00 clothbound.

A descriptive atlas of "normal" trout tissues which will be useful to people of varied backgrounds, united by a common interest in trout histology. For the student of poikilothermic pathology with a modest background in vertebrate anatomy and physiology, it will provide a limited textbook of functional anatomy. We hope further that researchers may find it useful for preliminary reading and reference material prior to examination of the effects of debilitating organisms or chemicals. Presentation of material throughout the atlas is organized in such a manner that the reader may quickly locate a specific subject and examine photomicrographs related to it. Each chapter consists of a short disuussion concerning the structure and function of an organ or system, followed by photomicrographs and a limited bibliography of relevant publications. A useful index is included. The atlas does not cover the complete subject of trout histology. Topics of discussion have been intentionally limited to those which have previously been of primary interest to the comparative histopathologist. (Authors)

18588. Kokhanskaya, Ye. M. (A. N. Severtsov Inst. of Evolutionary Morphology and Anim. Ecol. (IEMEZh), USSR Academy of Sciences, Moscow, USSR). 1973. THE EFFECT OF ULTRAVIOLET RADIATION ON THE EGGS OF THE SEVRYUGA [Acipenser stellatus (Pallas)]. J. Ichthyol., 13(3): 406-413.

The article is devoted to the effect of ultraviolet (UV) radiation on sevryuga eggs. The lethal UV radiation doses are established for the different stages of embryogeneses. The lower lethal threshold and the UV doses which do not have an adverse effect on the hatching of larvae are determined. Data have been obtained on the reaction of the vegetative parts of the Saprolegnia fungus (its mycelium) to the UV doses employed in the experiment. Because of the increased resistance of the Saprolegnia mycelium to UV (by comparison with sevryuga eggs) it is impermissible to attempt to use UV radiation for Saprolegnia control directly in incubation apparatuses.

18589. McCart, P., and H. Bain (Aquatic Environments Ltd., Crossfield, Alberta, Canada). 1974. AN ISOLATED POPULATION OF ARCTIC CHAR (Salvelinus alpinus) INHABITING A WARM MINERAL SPRING ABOVE A WATERFALL AT CACHE CREEK, NORTHWEST TERRITORIES. J. Fish. Res. Board Can., 31(8): 1408-1414.

Cache Creek Spring provides an unusual overwintering habitat for a population of Arctic char (Salvelinus alpinus) isolated above a falls impassable to fish moving upstream. During winter, water temperatures (14-16 C) and dissolved solid concentrations (approximately 2600 ppm) are high and oxygen concentrations (0.2-6.8 ppm) are low. Arctic char in the springs differ meristically from those downstream of the falls. The former have significantly more gillrakers (mean 21.7 compared with 21.1) and parr marks (15.1 and 13.5) but fewer pyloric caeca (26.0 and 28.2) and vertebrae (64.7 and 67.1) than the latter. Growth appears similar to that of char inhabiting more typical spring habitats. (Authors)

18590. Lightner, Donald V. (NMFS, Gulf Coastal Fish. Center, Galveston Lab., Galveston, Texas 77550). 1974. CASE REPORTS OF OSSIFYING FIBROMATA IN THE STRIPED MULLET. J. Wildl. Diseases, 10(4): 317-320.

Ossifying fibromata are described from three striped mullet (Mugil cephalus) from the Gulf of Mexico near Galveston, Texas. The tumors were classified as ossifying fibromata based on their predominately fibrous composition, the presence of bone spicules in the larger tumors, and the absence of mitotic figures. (Auth.)

18591. Kirchner, Warren B. (Dept. of Biol. Sci., State Univ. College of New York at Brockport, Brockport, N. Y. 14420). 1974. A SCUBA DIVER OPERATED CORER FOR DETERMINING VERTICAL DISTRIBUTION IN THE BENTHOS. Prog. Fish-Cult., 36(1): 27-28.

18592. Shaw, T. L., and V. M. Brown (Water Poll. Res. Lab. of the Dept. of the Environ., Stevenage, Herts, England). 1974. THE TOXICITY OF SOME FORMS OF COPPER TO RAINBOW TROUT. Water Research, 8(6): 377-382.

The lethal toxicity of copper to rainbow trout in hard water was found to be related to the total concentration at which soluble copper, Cu^{2+} and $CuCO_3$, was present in the water, rather than to the concentration of either of these two forms alone. It is suggested that, except in the presence of highly toxic organo-copper compounds, from a knowledge of the cupric ion concn, the pH, and the alkalinity of a water, the total concentration of soluble copper can be calculated and hence the toxicity of that water determined. (Authors)

18593. Reinert, Robert E., Linda J. Stone, and Wayne A. Willford (U.S. Fish & Wildl. Serv., Great Lakes Fish. Lab., Ann Arbor, Michigan 48107). 1974. EFFECT OF TEMPERATURE ON ACCUMULATION OF METHYLMERCURIC CHLORIDE AND p,p'DDT BY RAINBOW TROUT (Salmo gairdneri). J. Fish. Res. Board Can., 31(10): 1649-1652.

Amounts of mercury and DDT residues accumulated from water by yearling rainbow trout (Salmo gairdneri) in the laboratory increased as water temperature increased. Fish exposed to methylmercuric chloride at concentrations of 234-263 parts per trillion for 12 wk at 5, 10, and 15 C accumulated 1.19, 1.71, and 1.96 ppm; fish exposed to p,p'DDT at concentrations of 133-176 parts per trillion accumulated 3.76, 5.93, and 6.82 ppm. Concentrations of mercury accumulated by the fish were significantly different ($P < 0.01$) at each of the three temperatures, and the concentrations of DDT were significantly different at 5 and 10 and 5 and 15 C. Throughout the period of exposure, the concentration factors (concentration of contaminant in the fish/concentration in water) at each of the three temperatures were far higher for p,p'DDT than for methylmercuric chloride. (Authors)

18594. McGlamery, Merrill H., Jr., and J. B. Gratzek (Dept. of Medical Microbiology, Coll. of Vet. Med., Univ. of Georgia, Athens, Georgia 30602). 1974. STUNTING SYNDROME ASSOCIATED WITH YOUNG CHANNEL CATFISH THAT SURVIVED EXPOSURE TO CHANNEL CATFISH VIRUS. Prog. Fish-Cult., 36(1): 38-41.

18595. Ryabov, I. N. (Dept. of Ichthyol., Moscow Univ., Moscow, USSR). 1973. EMBRYONIC AND LARVAL DEVELOPMENT CHARACTERISTICS OF HYBRIDS OF SILVER CARP [Hypophthalmichthys molitrix (Val)] AND EASTERN BREAM [Abramis brama orientalis (Berg)]. J. Ichthyol., 13(5): 701-714.

Consideration is given to the ecological and morphological development characteristics of the following hybrids: grass carp ♀ X Eastern bream ♂ and silver carp ♀ X Eastern bream ♂. The characters of both parents were distinctively manifested in the development of the hybrids. Paternal characters were particularly clearly reflected in the number of trunk and caudal myotomes and the rate of segmentation, in the shape of the yolk sac, in development of the embryonic and larval respiratory organs and in characteristics of the pigmentation of the eyes and body. Viable hybrid silver carp ♀ X Eastern bream ♂ larvae were obtained; the grass carp ♀ X Eastern bream ♂ hybrids perished on transition to exogenous feeding.

18596. Eddy, F. B. (Dept. of Biol. Sci., Univ. of Lancaster, Lancaster, Lancashire, United Kingdom). 1974. OSMOTIC PROPERTIES OF THE PERIVITELLINE FLUID AND SOME PROPERTIES OF THE CHORION OF ATLANTIC SALMON EGGS (Salmo salar). J. Zool., Lond., 174(2): 237-243.

The chorion and perivitelline fluid of Atlantic salmon eggs were investigated by chemical and physical methods. The turgor pressure of the chorion in water hardened eggs was about 60 mm Hg. With newly stripped eggs in fresh water a similar pressure was achieved after about one day but the process of water uptake could be osmotically inhibited by adding high molecular weight substances to the external medium. Perivitelline fluid contained about 58% water the remainder being a high molecular weight substance consisting mainly of protein but also containing significant quantities of carbohydrate and lipid. The functions of the chorion are discussed with reference to salmon eggs and also to marine pelagic fish eggs such as those of the plaice. (Auth.)

18597. Summerfelt, R. C., and S. C. Yin (Oklahoma Coop. Fish. Unit, Stillwater, Oklahoma). 1974. PAUNCH MANURE AS A FEED SUPPLEMENT IN CHANNEL CATFISH FARMING. Environ. Protection Agency, Technology Series Report EPA-660/2-74-046, 114 p., available from GPO Sup Doc as EP1.23: 660/2-74-046, $1.60, microfiche from NTIS, Springfield, Va. 22161 as PB-235 575, $2.25; Selected Water Resources Abstracts, 7(22): p. 51.

Part A of this report examines the feasibility of using dried paunch at 10, 20 and 30% levels in feed for pond-rearing yearling channel catfish to market-size, and at a 10% level for cage-culture of yearling catfish. Part B describes the effects of fish culture, using standard feeds and paunch-containing feeds, on water quality of fish ponds. In all, one physical, one bacteriological, and fifteen chemical parameters were measured. Regardless of feed type, pond-reared fish grew faster than the cage-reared fish. There was no significant difference in final weights attained by fish given standard, and 10 and 20% paunch feeds but fish given 30% paunch were significantly smaller. Feed costs per kg of catfish produced using the standard commercial sinking feed and sinking feed containing 10% paunch were essentially equal, but feed costs for making sinking feed with 10 and 20% paunch were greater than the standard. The costs of making a floating feed containing 10% paunch for raceway or cage culture of channel catfish were uneconomical. Neither the pond culture nor the cage culture caused deterioration in water quality in any of the ponds to any appreciable degree in one growing season of 24 weeks, and there was no significant difference in water quality in general between the ponds in which commercial feeds were used and those in which paunch-containing feeds were used -- this was true in both pond and cage cultures.

18598. Jimenez G., Fernando, and Eduardo Caballero y Caballero. 1974. DIGENETIC TREMATODES OF FRESHWATER FISH OF NUEVO LEON, MEXICO. II. Crassicutis bravoae n. sp. OF THE MOJARRA Cichlosoma cyanoguttatus cyanoguttatus (Baird et Girard). [Trematodos Digeneos de Peces Dulceacuicolas de Nuevo Leon, Mexico II. Crassicutis bravoae n. sp. de la mojarra Cichlasoma cyanoguttatus cyanoguttatus (Baird et Girard)]. Publicaciones Biologicas Instituto de Investigaciones Cientificas, Universidad Autonoma de Nuevo Leon, Monterrey, N. L., Mexico, 1(6): 65-77, illus. In Spanish with English summ.

The species of trematode herein described was obtained from the stomach and intestine of 42 specimens of Cichlasoma cyanoguttatus cyanoguttatus (Baird et Girard) "mojarras" collected in Rodrigo Gomez Dam, Santiago, Nuevo Leon, Mexico. It represents a new species: Crassicutis bravoae n. sp., because of the position of the testes and the distribution of the vitelline glands. Variations in morphology are presented, they are too small to support description as a different species; statistics are applied as an approach of method of decision. A new relation between species of Crassicutis Manter, 1936 is presented. A comparative diagram complements it; identification key and a map indicating species geographical distribution are included.

18599. Plosila, Daniel S., and Walter T. Keller (N. Y. State Dept. of Environ. Conserv., Ray Brook, New York 12977). 1974. EFFECTS OF QUANTITY OF STORED SPERM AND WATER ON FERTILIZATION OF BROOK TROUT EGGS. Prog. Fish-Cult., 36(1): 42-45.

18600. Amundrud, James R., Daniel J. Faber, and Allen Keast (Queen's Univ., Kingston, Ontario, Canada). 1974. SEASONAL SUCCESSION OF FREE-SWIMMING PERCIFORM LARVAE IN LAKE OPINICON, ONTARIO. J. Fish. Res. Board Can., 31(10): 1661-1665.

Free-swimming larvae of five perciform species were collected with tow nets in large numbers in Lake Opinicon from May to August of 1969 and 1970. The species appeared in the same seasonal sequence during the 2 yr: first yellow perch (Perca flavescens) followed by logperch (Percina caprodes), black crappies (Pomoxis nigromaculatus), and pumpkinseeds and bluegills (Lepomis gibbosus and L. macrochirus). Peaks of larval abundance, and also hatching, occurred earlier in 1970, when nest-site temperatures from early May to mid-June showed faster lake warm-up than in 1969. (Authors)

18601. McCarthy, D. H., J. P. Stevenson, and A. W. Salsbury (MAFF, Fish. Lab., Weymouth, Dorset, United Kingdom). 1974. COMBINED IN VITRO ACTIVITY OF TRIMETHOPRIM AND SULPHONAMIDES ON FISH-PATHOGENIC BACTERIA. Aquaculture, 3(1): 87-91; Fish Health News, 3(4): p. 15.

The relative in-vitro activity of 7 sulphonamides, Sulphadiazine, Sulphanilamide, Sulphadimidine, Sulphamerazine, Sulphathiazole, Sulphamethoxypyridazine, Sulphamethylphenazole, each linked in turn to trimethoprim, was assessed for representatives of the following fish-pathogenic bacteria: Aeromonas punctata, A. salmonicida, Vibrio anguillarum, Pseudomonas sp., Haemophilus piscium. (Aquatic Sci. & Fish. Abs. 4Q6048G)

18602. Ishihara, Tadashi, and Masato Yasuda (Fac. of Fish., Nagasaki Univ., Nagasaki, Japan). 1974. STUDIES ON THIAMINASE I IN MARINE FISH - IV. EFFECT OF THIAMIN ON GROWTH OF RAINBOW TROUT AND SEA BREAM FED ANCHOVY. Bull. Jap. Soc. Sci. Fish., 40(7): 671-674.

The effect of dietary thiamin nitrate on the growth of rainbow trout and sea bream fed raw anchovy was investigated. The thiamin used in this experiment was coated with fat in order to prevent its decomposition by thiaminase present in raw anchovy. The feeding periods were 118 and 20 days for rainbow trout and sea bream, respectively. In both species, the weight gain was greater in fish on a thiamin-supplemented diet than in those on a diet without the vitamin. In rainbow trout, the thiamin concentration in the liver of the latter group gradually decreased, while blood pyruvic acid levels increased. In young sea bream, the thiamin content in muscle of the thiamin-deficient group decreased to levels as low as 40% of the initial value. Decomposition of the thiamin nitrate coated with fat was slow whereas that of the uncoated one was rapid.

18603. Jensen, A. L. (Environ. Protection Agency, Gulf Breeze Environ. Res. Lab., Gulf Breeze, Florida 32561). 1974. PREDATOR-PREY AND COMPETITION MODELS WITH STATE VARIABLES: BIOMASS, NUMBER OF INDIVIDUALS, AND AVERAGE INDIVIDUAL WEIGHT. J. Fish. Res. Board Can., 31(10): 1669-1674.

Applying the identity that biomass equals number of individuals multiplied by average individual weight, simultaneous equations for change with respect to time in biomass, number of individuals, and average individual weight are obtained for Kostitzin's predator-prey equations and for the Lotka-Volterra competition equations. By the same procedure applied here, simultaneous equations for these three variables can be obtained for other predator-prey and competition equations. These equations can be applied to determine the biomass, number of individuals, and average individual weight of interacting fish populations under different rates of exploitation. (Auth.)

18604. Ivankov, V. N., and V. P. Kurdyayeva (Dept. of Ichthyol. and Hydrobiol., Far Eastern Univ., Vladivostock, USSR). 1973. SYSTEMATIC DIFFERENCES AND THE ECOLOGICAL IMPORTANCE OF THE MEMBRANES IN FISH EGGS. J. Ichthyol., 13(6): 864-873.

A study has been made of the structure of the primary and secondary membranes (chorion) of the ova in different systematic and ecological groups. It is shown that in most fishes the structure of the chorion indicates the systematic status of the species, while the structure of the vitelline membrane is evidently due primarily to its protective function.

18605. Platts, William S. (USDA, Forest Serv., 316 East Myrtle Street, Boise, Idaho 83706). 1974. CHINOOK SALMON RUNS, FISH STANDING CROP AND SPECIES COMPOSITION IN THE SOUTH FORK SALMON RIVER, IDAHO. Progress Report V, U. S. Forest Service, Region 4, Ogden, Utah, 48 pp.

Discusses fish populations in the tributaries of the South Fork Salmon River and the anadromous return of chinook salmon. Also, discusses the west slope cutthroat trout, Dolly Varden, brook trout and whitefish. (Auth.)

18606. Schafer, R. D., and E. Swann (Immaculate Heart Coll., Los Angeles, California). 1974. FREE AMINO ACID VARIATIONS IN THE ANCHOVY, Engraulis mordax (Girard) FROM THE LOS ANGELES COASTAL AREA. In: Revue Internationale d'Oceanographie Medicale, 33, pp. 103-110; Selected Water Resources Abstracts, 7(21): p. 50.

Difference in free amino-acid content in anchovies was examined to determine the effects of water pollution. Specimens from non-polluted and polluted water were collected by net. White muscle tissue was used for analyses with an auto-analyser and both qualitative and quantitative differences in amino-acid content were noted. Aspartic acid, asparagine and cystine were not present in the controls but were found in one or more of the samples from polluted waters. Histidine was present in the controls in greater quantity than in the test samples. Other quantitative differences were found in taurine, lysine and glutamic acid. (Katz)

18607. Chau, Y. K., R. Gachter, and K. Lum-Shue-Chan (Dept. of the Environ., Canada Centre for Inland Waters, Burlington, Ontario, Canada). 1974. DETERMINATION OF THE APPARENT COMPLEXING CAPACITY OF LAKE WATERS. J. Fish. Res. Board Can., 31(9): 1515-1519.

A sensitive and accurate method is described for the measurement of the apparent complexing capacity of lake waters. It is based on the measurement of labile copper by differential pulse anodic stripping voltammetry after a number of ionic copper spikes have been allowed to equilibrate with the complexing materials in a water sample. Coefficients of variation for the determination of EDTA at a level of 0.50 μmole/liter in Hamilton Harbor water were 6 and 8%. Analysis of seven replicates of a Hamilton Harbor water sample gave an apparent complexing capacity of 0.52 μmole/liter Cu equivalent with a relative standard deviation of 7.7%. Analyses of a number of samples from Lake Erie and from lakes near Sudbury, Ontario gave a range from nondetectable to 0.70 μmole/liter Cu equivalent of complexing capacity. (Authors)

18608. Bachmann, Roger W., and John R. Jones (Dept. of Zool. and Entomol., Iowa State Univ., Ames, Iowa 50010). 1974. PHOSPHORUS INPUTS AND ALGAL BLOOMS IN LAKES. Iowa State Journal of Research, 49(2), part 1: 155-160.

The summer standing crops of plankton algae in a diverse group of lakes were significantly related to the annual inputs of total phosphorus divided by the lake volumes. Based on the relationship between Secchi disk transparency and chlorophyll-a concentrations, phosphorus inputs would have to be reduced below about 0.02 mg/l before significant increases in water transparency would be achieved as a result of reduced algal standing crops. (Authors)

18609. Smith, Ross A., J. Anne Holman, and Robert H. Kramer (Utah Coop. Fish. Unit, Utah State Univ., Logan, Utah 84322). 1974. AUTOMATIC BRINE SHRIMP FEEDER. Prog. Fish-Cult., 36(3): p. 133.

An automatic system for feeding newly-hatched live brine shrimp to fish is described. The system uses Halvin tapered plastic bags to hatch the brine shrimp, timed switches on a peristaltic pump, and air valves which shut off a bubbler in the bags. When the air bubblers is off the peristaltic pump is automatically turned on. The pump attached to tygon tubing takes concentrated brine shrimp from the bottom of the bag and delivers them to the fish tanks with a minimum of brine. The system can be set to supply brine shrimp to fish regularly throughout a 24-h period. (Authors)

18610. Gulin, V. V., and G. P. Rudenko (State Res. Inst. for Lake and River Fisheries (GosNIORKh), Leningrad, USSR). 1973. PROCEDURE FOR ASSESSMENT OF FISH PRODUCTION IN LAKES. J. Ichthyol., 13(6): 813-823.

Data are given on the biomass and production of fish populations in an eutrophic lake, as well as on their abundance and natural mortality coefficients differentiated by age groups. The method proposed for determination of production is not confined to special cases of their growth.

18611. Cho, C. Y., H. S. Bayley, and S. J. Slinger (Dept. of Nutr., Univ. of Guelph, Ontario N1G 2W1, Canada). 1974. PARTIAL REPLACEMENT OF HERRING MEAL WITH SOYBEAN MEAL AND OTHER CHANGES IN A DIET FOR RAINBOW TROUT (Salmo gairdneri). J. Fish. Res. Board Can., 31(9): 1523-1528.

Growth rate, feed efficiency, and mortality were not adversely affected by reducing the level of herring meal in an open formula dry-pellet diet fed to rainbow trout (Salmo gairdneri) in aquaria through which 80-90% of the effluent water was recirculated. The herring meal was reduced from 35 to 18%, and the level of soybean meal increased from 10 to 39%. The fish gained 5.5 and 5.4 kg/100 fish from 8 to 40 wk of age on the high and low herring meal diets, respectively. Deletion of brewers' yeast, corn fermentation extractives, and whey powder from the diet with the higher level of herring meal increased weight gain to 7.0 kg/100 fish. When the fermentation by-products were removed from the diet with the lower level of fish meal the gain was reduced to 4.8 kg/100 fish. All the diets contained 4% of soybean or rapeseed oil or a marine oil; the type of oil did not influence the gains, but the conversion of feed to gain was most efficient for the diet containing the marine oil. The apparent digestibilities of the proximate components of three of the diets suggested that the fermentation by-products were not as digestible to the fish as the other components of the diet. (Authors)

18612. Ivanova, Z. A. (Siberian Animal Husbandry Res. and Planning and Technol. Inst., Siberian Dept., All-Union Agric. Acad., Novosibirsk, USSR). 1973. BLOOD INDICATORS OF THE CARP [Cyprinus carpio (L.)] DURING ONTOGENY AND IN RELATION TO REARING CONDITIONS. J. Ichthyol., 13(3): 414-424.

Blood indicators were investigated in 5 age groups (1-4+) of a population of Altay carp (Cyprinus carpio L.). It was established that the age of the fish has a high degree of influence on the indicators of the red and white blood cells, the quantity of serum proteins and the proportions of the protein fractions, the content of sugar, calcium and phosphorus. Alteration in these indicators is noted on reconstruction of the functional activity of the organism in the period leading up to sexual maturity and also under the influence of regional factors and feeding conditions.

18613. Konikoff, Mark, and William M. Lewis (Fish. Res. Lab. and Dept. of Zool., Southern Illinois Univ., Carbondale, Illinois 62901). 1974. VARIATION IN WEIGHT OF CAGE-REARED CHANNEL CATFISH. Prog. Fish-Cult., 36(3): 138-144.

Weight measurements from channel catfish (Ictalurus punctatus) grown in floating cages showed that the coefficient of variation at harvest is essentially independent of initial variability and tends toward a typical value of 0.30 to 0.40. Shallow cages (0.6 m) reduced growth variation, but also resulted in more fighting. Rest areas in cages did not affect variation in growth or the normalcy of weight distribution. Low quality feed resulted in a strongly skewed weight distribution here designated differential growth. Normally distributed growth variation was suggested to be an expression of genetic differences. (Authors)

18614. Solbe, J. F. de L. G. (Water Poll. Res. Lab., Stevenage, England). 1973. THE RELATION BETWEEN WATER QUALITY AND THE STATUS OF FISH POPULATIONS IN WILLOW BROOK. Water Treatment and Examination, 22(1): 41-61; Selected Water Resources Abstracts, 7(22): p. 51.

The predicted acute lethal toxicity to rainbow trout of the water in the polluted Willow Brook, Northamptonshire, over a 25-month period has been used to describe the water quality. Toxicity varied greatly from day to day but regular seasonal variations were demonstrated in the lower reaches. It was greatly reduced as the water passed downstream, particularly as it passed through two upper lakes. A general relation was found between temperature and reduction in toxicity in the lower streams. Zinc was the predominant poison, ammonia and phenol being only occasionally important in the upper streams. Fish were found upstream of the polluting discharges and were absent for several kilometers downstream. Deene Lake supported 3 species and the number increased to ten 18 km below.

18615. Anderson, John R. (U.S. Fish & Wildl. Serv., Marion National Fish Hatchery, Marion, Alabama 36756). 1974. GLASS V-TRAP. Prog. Fish-Cult., 36(1): p. 53.

18616. Buikema, Arthur L., Jr., John Cairns, Jr., and Gail W. Sullivan (Dept. of Biol. and Center for Environ. Studies, Virginia Polytech. Inst. and State Univ., Blacksburg, Virginia 24061). 1974. EVALUATION OF Philodina acuticornis (ROTIFERA) AS A BIOASSAY ORGANISM FOR HEAVY METALS. Water Resources Bull., 10(4): 648-661.

A technique for using the rotifer Philodina acuticornis as a bioassay organism is described. The rotifer was exposed to a range of concentrations for each of 14 toxicants. The effects of the heavy metals cadmium, chromium, cobalt, copper, lead, mercury, nickel, silver and zinc were studied. Based upon 96 hours exposure in soft water the sensitivity of the rotifer to the metals from the most toxic to least toxic was: cadmium, mercury and copper, zinc, silver, nickel (chloride), chromium, nickel (sulfate), lead and cobalt. In hard water with 96 hours exposure the most to least toxic respectively were: cadmium, copper, mercury, chromium and lead. The 48 hour EC_{50} value suggests that zinc will follow mercury in relative toxicity when Philodina is tested in hard water. In a comparison of the toxicity of the chloride and sulfate salts of cadmium, nickel and zinc in soft water cadmium sulfate and zinc sulfate were more toxic after 96 hours; nickelous chloride was more toxic than nickelous sulfate. Increased water hardness decreased the toxicity of the heavy metals studied. The results suggest that this rotifer may be more sensitive than the bluegill sunfish to the salts of cadmium, copper, nickel, zinc and chromium and less sensitive to lead. Data for cobalt, silver and mercury were not available. Philodina was extremely tolerant of ammonium chloride and phenol. The feasibility and economics of using an inexpensive, readily cultured and available organism such as Philodina acuticornis as a bioassay organism were discussed. (Authors)

18617. Anderson, Richard O. 1974. INFLUENCE OF MORTALITY RATE ON PRODUCTION AND POTENTIAL SUSTAINED HARVEST OF LARGEMOUTH BASS POPULATIONS. In: Symposium on overharvest and mgmt of largemouth bass in small impoundments. N.C. Div. Amer. Fish. Soc., Spec. Pub. 3: 18-28.

A graphic method is used to model production and potential sustained harvest of largemouth bass populations. Analyses are made to show relationships between populations with similar growth rates but annual mortality rates of 40 and 80%. Assuming that the two populations have equal biomass at annulus formation, the population with high mortality may annually provide a potential sustained harvest of twice the weight and 5.5 times the number of fish compared to the low mortality population. However, the high mortality population must have a 5.5-fold greater recruitment to harvestable size to maintain equal biomass. Assuming an equal rate of recruitment to minimum harvestable size, the high and low mortality populations may yield equal numbers of fish but the average and potential weight of fish harvested may be 2.75 times greater in the low mortality population. If equal weights of a balanced bluegill population to serve as forage are assumed, the low mortality population may provide a 10% increase in weight harvested and a better quality of fishing. The model populations and calculated relationships are used as a basis for discussing different concepts and approaches to fishery management, with emphasis on protected length regulations, and for suggesting important areas of fishery research. (Auth.)

18618. Volgin, M. V. 1973. CULTIVATION OF MARKETABLE PELYAD [Coregonus peled (Gmelin)] IN LAKE TITOVO, NOVOSIBIRSK PROVINCE. J. Ichthyol, 13(6): 920-925.

A description is given of the results of stocking Lake Titovo with pelyad [Coregonus peled (Gmelin)] fry and fingerlings. Improvements were first carried out in the lake and the local fishes (perch and roach) were intensively removed. Lake Titovo was stocked several times in 1968-1969. Excellent size-weight indicators of the pelyad, its high condition factor and early sexual maturation are noted. Data are given on commercial return and the behavioral characteristics of the pelyad on the draining of the lake.

18619. Boyd, John (Biol. Sci. Section, Space Sciences Lab., Northrop Services, Inc., P.O. Box 34416, Houston, Texas 77034). 1974. A PORTABLE SINK WITH FOLDING DRAIN TABLE. Prog. Fish-Cult., 36(1): p. 58.

18620. Ota, Toru, and Minoru Yamada (Fac. of Fish., Hokkaido Univ., Hakodate, Japan). 1974. LIPIDS OF Masu SALMON - II. SEASONAL VARIATIONS IN THE LIPIDS OF Masu SALMON PARR DURING THE LIFE IN FRESH WATER. Bull. Jap. Soc. Sci. Fish., 40(7): 699-706. In Japanese with English abstract.

Differences in the seasonal variations of the lipid contents and the fatty acid compositions in the flesh of parr, resident type and seaward migration type of wild Masu salmon parr (Oncorhynchus masou) during fresh-water habitation were investigated. The lipid content decreased gradually from summer to winter in each type. In spring, the lipid content in the resident type increased rapidly, while that in the seaward migration type tended to decrease after a slight initial increase. In autumn, the lipid content in the resident type was less than that in the other two types. Palmitoleic, oleic, linoleic and linolenic acids decreased in winter, while eicosatetraenoic, eicosapentaenoic and decosahexaenoic acids increased. But these changes tended to vary with the type of fish. In spring, palmitoleic and oleic acids were less in the seaward migration type than in the resident type. It was considered that the decrease of the lipid content in each type from summer to winter was presumably due to diminution of the fish diets, and that the greater autumnal decrease in the resident type lipid content was related to maturation. It was also presumed that the spring decrease of both lipids and monoenoic acids in the seaward migration type was closely related to smolt-transformation.

18621. Makarova, N. P. (A. N. Severtsov Inst. of Evolutionary Morphol. and Animal Ecol., USSR Acad. of Sciences (IEMEZh), Moscow, USSR). 1973. SEASONAL CHANGES IN SOME OF THE PHYSIOLOGICAL CHARACTERISTICS OF THE PERCH [Perca fluviatilis L.] OF IVAN'KOVO RESERVOIR. J. Ichthyol., 13(5): 742-752.

We investigated changes in the food, the weight of the liver and the fat content of the perch (Perca fluviatilis L.) of Ivan'kovo Reservoir. Invertebrates predominated in the food of the perch in May-June; fish constituted the bulk of the food of large perch in June-October. Fat content on the viscera ranged between 0.3 and 1.5% of carcass weight in females and between 0.3 and 2.5% in males. The fat content of fish of both sexes was highest in July-August. The liver index of the perch, regarded as an indicator of its metabolic activity, ranges between 12.0 and 30.0% in females and between 15.0 and 28.0 % in males. The annual cycle of alteration in the fat content of the viscera and in the liver index is different in male and female perch.

18622. Engstrom-Heg, Robert, and Howard A. Loeb. 1974. MARKING TROUT BY CARBON INJECTION. N. Y. Fish Game J., 21(2): 173-176.

Graphite and lampblack, injected into the upper and lower jaws of fingerling brown trout, were retained as visible marks for from several months to over a year, depending on the formulation used. Best results were obtained with a 45 percent alkaline water suspension of graphite, emulsified with polysorbate 80 and injected into the lower jaw with a No. 20 needle. Fading occurs through overgrowth of opaque tissue and probably through transport away from the marked area via the lymphatic system. Dissection of the jaws showed residual carbon at the end of 2 years. The marks are non-toxic and non-mutilating. (Authors)

18623. Halter, Mark T., and Howard E. Johnson (Dept. of Fish. and Wildl., Mich. State Univ., East Lansing, Michigan 48824). 1974. ACUTE TOXICITIES OF A POLYCHLORINATED BIPHENYL (PCB) AND DDT ALONE AND IN COMBINATION TO EARLY LIFE STAGES OF COHO SALMON (Oncorhynchus kisutch). J. Fish. Res. Board Can., 31(9): 1543-1547.

Egg hatchability, mean time to hatching, and alevin survival and growth decreased when coho salmon (Oncorhynchus kisutch) eggs and alevins were exposed at 12-14 C to 4.4 μg/liter Aroclor 1254 or higher until 4 wk after hatching, and to 15 μg/liter or more until 2 days before hatching. Premature hatching occurred in all egg groups exposed to the PCB. The median survival times of fry exposed to Aroclor 1254-DDT combinations for two wk were similar to those after exposure to the various concentrations of DDT alone. The more rapid reaction time to DDT is suggested as the basis for lack of additive toxicity. (Authors)

18624. Larkin, P. A. (With appendices by B. A. Campbell and C. H. Clay) (Inst. of Animal Resource Ecol., Univ. of Brit. Columbia, Vancouver, British Columbia V6T 1W5, Canada). 1974. PLAY IT AGAIN SAM - AN ESSAY ON SALMON ENHANCEMENT. J. Fish. Res. Board Can., 31(8): 1433-1459.

For more than 100 years efforts have been made to increase the abundance of the various species of Pacific salmon. The success of these ventures is largely a matter of conjecture because the scale of natural fluctuations is sufficient to mask the effect of human intervention. No well-defined program for salmon enhancement has yet been developed for British Columbia as a whole. This is mainly attributable to the pressures for providing protection for the existing stocks in the circumstances of an intensive fishery and increasing effects of other resource uses. From a social point of view, salmon enhancement is a highly desirable activity. Salmon occupy a special place in the culture of residents of the Pacific coast. Salmon are economically valuable and salmon fishing provides a rich source of employment. Recreational fisheries are valuable but their true economic worth is difficult to judge. Benefit:cost ratios for salmon enhancement should be calculated for whole programs rather than for individual projects to obtain an approach consistent with the desirable strategy of development. From a biological point of view, salmon enhancement is feasible. There is potential in the ocean for growing more salmon; many historic runs can be rebuilt and there are many opportunities for colonizing watersheds that are currently inaccessible to salmon. Harvesting of increased stocks of salmon could pose risks for natural stocks that are relatively unproductive. More effective management and development of new strains of salmon may be required in these circumstances. Predator-control programs may in some instances be useful adjuncts to salmon-enhancement projects. The types of enhancement activity that will most likely be rewarding are those that interfere least with the natural life history. Removal of obstructions, regulation of stream flow, construction of artificial spawning channels, are typical simple measures that involve less research information and less risk than rearing hatcheries. Priorities for different salmon-enhancement projects involve consideration of the regional economic and social conditions as well as appreciation of the biological and physical problems. Regardless of priorities it is essential to a successful program that there be a commitment to continuity. Additionally, the total administrative complex for salmon enhancement should involve research components. The execution of a successful salmon-enhancement program depends on the establishment of an agency with the single responsibility of salmon enhancement. The financing of a successful program should depend partly on revenues generated from the resource users, such as a tax on commercially caught salmon, a license for saltwater angling. Special grants from federal and provincial governments would also be appropriate. Regardless of the administrative arrangements, it is urgently necessary that provincial government involvement be more substantial than it is at present. With their control over resource management practices, the provincial government is in a vital position for maintenance of freshwater environments. An investment of at least $100 million, and probably twice that amount, could be undertaken in a salmon-enhancement program that could be executed within 10 years. There are compelling reasons for starting on this enhancement program immediately. (Auth.)

18625. Stromberg, Paul C., and John L. Crites (Center for Lake Erie Area Res. and Dept. of Zool., The Ohio State Univ., 1735 Neil Ave., Columbus, Ohio 43210). 1974. TRIAENOPHORIASIS IN LAKE ERIE WHITE BASS, Morone chrysops. J. Wildl. Dis., 10(4): 352-358.

The pseudophyllidean tapeworm, Triaenophorus nodulosus, was found in 51% of the adult white bass, Morone chrysops, sampled from western Lake Erie during the summer of 1973. Prevalence of infection with Triaenophorus increased with size and age of fishes. This worm is responsible for the disease triaenophoriasis, which is grossly characterized by large, white cysts, dark-brown "streaks" and hemorrhages in the liver. Microscopically, there is an acute inflammatory response, necrosis of liver parenchyma, squamous metaplasia, fibrosis and displacement of liver tissue as the tapeworm grows. Many plerocercoids were necrotic and surrounded by a dense tissue. The pathophysiology of extensive liver obstruction needs to be investigated as well as its effect upon infected fish populations. (Authors)

18626. Ichikawa, Ryushi, and Ippei Suyama (Div. of Environ. Health, National Inst. of Radiological Sciences, Chiba, Japan). 1974. EFFECTS OF TRITIATED WATER ON THE EMBRYONIC DEVELOPMENT OF TWO MARINE TELEOSTS. Bull. Jap. Soc. Sci. Fish., 40(8): 819-824. In English.

Artificially fertilized eggs of common flounder, Paralichthys olivaceus and a species of puffer, Fugu niphobles were reared until hatching in tritiated sea water of various concentrations. No significant difference in their hatchability was observed between control and tritiated water groups of 10^{-8} to 10^{-2} Ci/l. However, a decrease in puffer egg hatchability was observed in tritiated water of very high concentrations, i.e., 1 and 10 Ci/l. Absorbed radiation dose was calculated to be 2160 rad in 180 hours for the 1 Ci/l group and 15,600 rad in 130 hours for the 10 Ci/l group. The hatched larvae of the 10 Ci/l group were rather inactive, lying on the bottom of the tank, whereas the control larvae swam actively. Compared with control larvae, the 10 Ci/l larvae developed smaller stumpy-shaped bodies with swollen abdomens. Although the eye diameter of the 10 Ci/l larvae was found to be only about 57 percent that of the controls, the body weights of both groups were nearly equal, possibly due to the larger amount of residual yolk in the 10 Ci/l larvae. These findings indicate that the morphological development of embryos reared in tritiated water of high concentration is retarded.

18627. Solbe, J. F. De L. G. (Water Poll. Res. Lab. of the Dept. of the Environ., Stevenage, Herts, England). 1974. THE TOXICITY OF ZINC SULPHATE TO RAINBOW TROUT IN VERY HARD WATER. Water Research, 8(6): 389-391.

18628. Lear, W. H., R. F. Burfitt, and W. N. Batten. 1974. SEASONAL TRENDS IN THE BIOLOGICAL CHARACTERISTICS OF ATLANTIC SALMON IN THE COMMERCIAL MARINE FISHERY AT BONAVISTA, NEWFOUNDLAND. Fish. Res. Board Can., Technical Report No. 477, 43 p., Manuscript status.

The average fork lengths of Atlantic salmon taken by the commercial fishery at Bonavista in 1972 decreased steadily from 68.0 cm during June 13-17 to 55.8 cm during July 10-14. There is no significant difference in average fork lengths of 1-sea-year fish throughout the 6-week period from June 13 to July 20. There is a significant increase in fork length of 2-sea-year fish from 73.8 cm during June 13-17 to 77.1 cm during July 10-14. There was no significant difference between average fork length of 3-sea-year fish taken from June 13 to June 28. The average fork lengths of previously spawned fish decreased significantly from 70.63 cm during June 13-17 to 57.50 cm during July 17-20. There was no significant difference in the average river ages of 1-sea-year fish between June 13 and July 20. Overall average river age of 1-sea-year fish over the period was 3.24 years. The average river ages of 2-sea-year fish increased significantly from 2.89 during July 13-17 to 4.44 during July 10-14 indicating that the southern stocks of Atlantic salmon contribute more significantly to the early portion of the Bonavista fishery than during the latter part while the contribution from the northern stocks increases with time. There was no significant difference in average river ages of 3-sea-year fish from June 13 to 30. Overall average river age of 3-sea-year fish was 2.09 years. The average sea ages of Atlantic salmon from the Bonavista fishery declined from 1.73 years during June 13-17 to 1.00 years during July 17-20. The proportion of 1-sea-year fish increased from 28% during June 13-17 to 90% during July 4-7 and to 98% during July 17-20. The average whole weights of 1-sea-year fish increased significantly from June 13-17 (1.91 kg) to July 17-30 (2.04 kg). There is no significant difference in whole weights of the 2-sea-year fish between June 13-17 to July 10-14. Similarly there was no difference in whole weights of the 3-sea-year fish between June 13-17 and June 26-30. There is a general increase in condition of Atlantic salmon, except previous spawners, from June 13-17 (1.123) to July 17-20 (1.153). The sex ratios of the various sea age classes of Atlantic salmon in the Bonavista fishery are as follows: 1-sea-year (56% female), 2-sea-year (72% female), 3-sea-year (88% female) and previous spawners (61% female). Capelin accounted for approximately 90% of the weight of food found in the stomachs of 1- and 2-sea-year Atlantic salmon at Bonavista. The 3-sea-year fish were feeding mainly on capelin (80% of food by weight) with some herring (20% by weight) being in their diet. (Authors' summ.)

18629. Russo, Rosemarie C., Charlie E. Smith, and Robert V. Thurston (Dept. of Chem., Fish. Bioassay Lab., Montana State Univ., Bozeman, Montana 59715). 1974. ACUTE TOXICITY OF NITRITE TO RAINBOW TROUT (Salmo gairdneri). J. Fish. Res. Board Can., 31(10): 1653-1655.

Flow-through bioassays on the acute toxicity of nitrite to rainbow trout (Salmo gairdneri) of four different sizes (2-235 g) showed median lethal concentration (LC50) values for 4 days ranging from 0.19 to 0.39 mg/liter NO_2-N. For 12-g rainbow trout the asymptotic LC50 was 0.14-0.15 mg/liter NO_2-N after 8 days. (Authors)

18630. Jarzynowa, Barbara (Akademia Rolnicza w Lublinie, Zespol Rybactwa Kierownik Zespolu, Poland). 1974. THE CONSUMPTION OUTPUT OF BREAM - Abramis brama (Linnaeus, 1758) INFECTED WITH LIGULOSIS (Wydajnosc Konsumpcyjna Leszcza - Abramis brama (Linnaeus, 1758) Zarazonego Liguloza). Roczniki Nauk Rolniczych, 96(2): 47-58. In Polish.

The consumption output of breams infested with the tapeworm Ligula intestinalis (L.) and those free of the parasite was determined. The weight of head, skin, internal organs, backbone with fins, the upper and lower fillets both in the healthy and diseased fish was analysed, as well as the weight of plerocercoids of the tapeworm in the infested fish. Comparison was made of the weight of the individual body parts with the total weight of fish. (Auth.'s synopsis)

18631. Yukhimenko, S. S. 1972. PARASITES OF YOUNG SILVER CARP Hypophthalmichthys molitrix (Val.) AND GRASS CARP Ctenopharyngodon idella (Val.) IN THE AMUR RIVER. Izv. Tikhookean Nauchno-Issled Inst. Rybn. Khoz. Okeanogr. 77, pp. 151-159. In Russian. Selected Water Resources Abstracts, 7(24): p. 76.

Complete parasitological autopsy was used to investigate 575 species of uneven aged young silver carp and 167 specimens of young grass carp caught in the central and lower reaches of the Amur, USSR. Species (34) of parasites were found in the silver carp and 20 spp. in the grass carp. The eggs and free embryos of the silver and grass carp with a body length to 7.0-7.3 mm are free of parasites. When the embryos reach a body length of more than 7.5 mm they are infected by parasites whose quantitative and qualitative composition varies with the age of the fish. Pathogenic parasites as Thelohanellus oculileucisci and Trichodina nobilis are found in fishes of young age groups. -- Biological Abstracts, Inc.

18632. Aleyev, Yu. G., and O. P. Ovcharov (Inst. of the Biol. of the Southern Seas, Ukrainian Acad. of Sciences, Sevastopol', USSR). 1973. THE THREE-DIMENSIONAL PATTERN OF FLOW ROUND A MOVING FISH. J. Ichthyol., 13(6): 933-936.

18633. Sarig, S., and M. Marek (Lab. for Res. of Fish Diseases, Nir-David, Israel). 1974. RESULTS OF INTENSIVE AND SEMI-INTENSIVE FISH BREEDING TECHNIQUES IN ISRAEL IN 1971-1973. Bamidgeh, 26(2): 28-48, illus.

Results of observations of intensive and semi-intensive cultures in test and commercial ponds in 1971-1972 are analyzed. The possibility of nursing fingerlings directly from hatching to 1.5 - 24-g size in dense populations in intensive and semi-intensive conditions was tested. Daily growth increments of 44-148 kg per ha were obtained. In nursing of stage B fingerlings to a size (59-238 g) suitable for stocking production ponds, daily growth increments of 35-126 kg per ha were observed. Intensive monoculture of carps and tilapias in production ponds gave daily yields of 59-143 kg tilapias per ha and 53-127 kg carps per ha. In polyculture of carps and tilapias, the daily yields per ha varied between 85 to 165 kg. In semi-intensive growth conditions in regular commercial production ponds of 1-5 ha size, polyculture of several species gave daily yields per ha of 37-77 kg. A comparison of yields from the same ponds in conventional and semi-intensive growth conditions showed an increase of from 15% to 314% with the intensive culture. In all cases, an increase of fish density per ha was the deciding factor in the yield increase. The densities in ponds at the first stage of nursing varied from half a million to one million fingerlings per ha from 20,000 to 100,000 in the second nursing stage and from 10,000 to 60,000 fish per ha in production ponds. No fish mortalities due to oxygen

deficiency were observed in any of the ponds fitted with air suppliers, via blowers and perforated pipes or pipes with one focus for air outlet. The food index in production ponds varied from 1.6 to 3. (Authors' summ.)

18634. Chien, Shih Ming (Dept. of Fish. and Allied Aquacult., Agric. Exp. Sta., Auburn Univ., Auburn, Alabama 36830). 1974. DACTYLOGYRIDS FROM NORTH AMERICAN CYPRINIDS OF THE GENUS Nocomis: THE limulus AND THE mollis GROUPS. J. Parasitol., 60(5): 773-776.

Two dactylogyrid (Monogenea) morphologically similar groups, limulus and mollis, parasitizing the North American cyprinid fish genus Nocomis are reported. Three new species are described: Dactylogyrus flagristylus sp. n. taken from N. asper, N. biguttatus, and N. effusus; D. malleolus sp. n. taken from N. micropogon and N. leptocephalus leptocephalus; and D. mollis sp. n. taken from N. raneyi and N. micropogon. D. limulus Rogers, 1967, was recovered from N. l. bellicus, and for the first time from N. l. interocularis and N. l. leptocephalus. Known distribution and parasite phylogeny are discussed. (Auth.)

18635. Crossman, John S., Roger L. Kaesler, and John Cairns, Jr. (Dept. of Biol. and Center for Environ. Studies, Virginia Polytech. Inst. and State Univ., Blacksburg, Virginia 24061). 1974. THE USE OF CLUSTER ANALYSIS IN THE ASSESSMENT OF SPILLS OF HAZARDOUS MATERIALS. Reprint: Amer. Midl. Nat., 92(1): 94-114.

The macrobenthic community of Clinch River, near Carbo, Virginia, has twice been subjected to acute stress caused by major industrial spills from a power plant. The first spill, which resulted in a high pH shock, was from a fly-ash retaining pond in 1967. The second was an acid spill in 1970 with consequent low pH shock. Stream surveys were made in 1969, 1970 and 1971. This paper reports the results of Q-mode cluster analysis of presence-absence data on the total aquatic insect fauna, several orders of insects considered separately, and Gastropoda from those surveys. Recovery from the effects of the fly-ash spill by all elements of the fauna studied except the Gastropoda was well under way by the summer of 1969. Nevertheless, the insect fauna in samples from the area affected by the spill was still different from that in unpolluted reaches of the stream, although it was not possible to discriminate between remnant effects of the spills and chronic stress due to the day-to-day operation of the power plant. The spill of acid in 1970 eliminated many elements of the fauna from about 30 km of the river. Again, by the end of the summer recovery was well under way for all groups except the Gastropoda. Cluster analysis was particularly useful in determining the effects of type of substrate, time of sampling, longitudinal succession, and flooding on the composition of the macrobenthic community. It is suggested that one effect of flooding may be to make the fauna more homogeneous so there is a more nearly equal distribution of macrobenthic organisms among the stations from which samples were collected. (Authors)

18636. D'Amelio, V., G. Russo, and D. Ferraro (Instituto di Istologia ed Embriologia, Palermo Univ., Italy). 1974. THE EFFECT OF HEAVY METAL ON PROTEIN SYNTHESIS IN CRUSTACEANS AND FISH. In: Revue Internationale d' Oceanographie Medicale, Vol. 33, pp. 111-118; Selected Water Resources Abstracts, 7(21) p. 50.

Treatment of Carassius auratus with lead has been found to influence three parameters of blood cells. Hemoglobin synthesis is strongly inhibited, aminolevilinic acid dehydrase activity is reduced and cell density is affected by lead. Eriphia spinifrons was treated with lead and the hepatopancreas was examined for activity and presence of polyribosomes in protein synthesis. After 30 days in the presence of 0.3 mg/l of lead nitrate, polyribosomes were lacking indicating a reduction of protein synthesis.

18637. Pedersen, M. G., W. K. Hershberger, and M. R. Juchan (Coll. of Fish., Univ. of Wash., Seattle, Washington 98195). 1974. METABOLISM OF 3,4-BENZPYRENE IN RAINBOW TROUT (Salmo gairdneri). Bull. Environ. Contamin. Toxicol., 12(4): 481-486.

18638. Sherstneva, T. A., and A. A. Shabalina (State Res. Inst. for Lake and River Fisheries (GosNIORKh), Leningrad, USSR). 1973. SOME ASPECTS OF CARBOHYDRATE-LIPID METABOLISM IN RAINBOW TROUT [Salmo irideus (Gibb.)] FOLLOWING LENGTHY STARVATION. J. Ichthyol., 13(4): 576-582.

Information is given concerning alteration in the concentration of sugar and non-esterified fatty acid (NEFA) in the blood serum and of glycogen in the tissues of the rainbow trout following prolonged starvation in different seasons. It is shown that glycemia level does not alter in the course of starvation, but that NEFA level is reduced. Glycogen concentration in the liver and in the white and red muscles is reduced following starvation. It is noted that the most significant reductions in the concentration of NEFA and of glycogen in the tissues occur at high temperatures.

18639. Kroger, R. L., G. B. Sekavec, and E. J. Levi (NMFS, Atlantic Est. Fish. Center, Beaufort, North Carolina 28516). 1974. LOSS OF FERROMAGNETIC TAGS WHEN INJECTED INTO THE AIR BLADDER AND ABDOMINAL CAVITY OF ATLANTIC MENHADEN, Brevoortia tyrannus. Journal Du Conseil, 35(3): 244-248.

18640. McKern, J. L., and H. F. Horton, and K. V. Koski (Dept. of Fish. and Wildl., Oregon State Univ., Corvallis, Oregon 97331). 1974. DEVELOPMENT OF STEELHEAD TROUT (Salmo gairdneri) OTOLITHS AND THEIR USE FOR AGE ANALYSIS AND FOR SEPARATING SUMMER FROM WINTER RACES AND WILD FROM HATCHERY STOCKS. J. Fish. Res. Board Can., 31(8): 1420-1426.

In steelhead trout (Salmo gairdneri) the first pair of otoliths (sagittae) appeared in X-ray photographs of embryos 14 days before hatching and were the first calcified structures visible. Subsequent growth characteristics of otoliths were used in identifying as freshwater and ocean annuli and spawning checks, and indicated seven age-classes and 26 life history patterns among 434 specimens. Diameters of otolith nuclei were smaller ($P \leq 0.01$) in summer steelhead (mean = 0.348 mm) than in winter steelhead (mean = 0.436 mm), and diagonally measured otolith growth representing the first year of life was larger ($P \leq 0.01$) in hatchery-reared (1.291 mm) than in wild steelhead (0.868 mm for 2/ fish and 0.769 mm for 3/ fish). Absence of changes in density in the freshwater growth of otoliths from hatchery-reared steelhead and presence of such changes in the otoliths from wild steelhead served as a subjective means of accurately separating the two stocks. (Authors)

18641. Ota, Toru, and Minoru Yamada (Fac. of Fish., Hokkaido Univ., Hakodate, Japan). 1974. LIPIDS OF Masu SALMON - III. DIFFERENCES IN THE LIPIDS OF RESIDENT TYPE AND SEAWARD MIGRATION TYPE OF Masu SALMON PARR DURING THE PERIOD OF SEAWARD MIGRATION. Bull. Jap. Soc. Sci. Fish., 40(7): 707-713. In Japanese.

Differences in the lipid compositions and the fatty acid compositions of the resident type and seaward migration type of Masu salmon parr (Oncorhynchus masou) flesh lipids during the period of seaward migration were investigated. The lipid content of the seaward migration type was less than one-half that of the resident type. Comparison of the resident type and seaward migration type lipid compositions indicated a lower content of triglycerides and higher contents of phospholipids and free sterols in the seaward migration type. The contents of each fatty acid were uniformly lower in the seaward migration type than in the resident type, the decrease in palmitoleic and oleic acids being more conspicuous in the seaward migration type. It was considered that the consumption of lipids (mainly triglycerides) as the energy source in the seaward migration type swelled during the period of seaward migration and that, among the fatty acids, the monoenoic acids might be chiefly consumed. Furthermore, the consumption of polyenoic acids as well as saturated and monoenoic acids might increase during the latter stage of smolt-transformation.

18642. Koski, Robert T. (Mar. Res. Lab., Univ. of Connecticut, Storrs, Conn.) 1974. SINISTRALITY AND ALBINISM AMONG HOGCHOKERS IN THE HUDSON RIVER. N.Y. Fish Game J., 21(2): 186-187, illus.

18643. Dolinin, V. A. (Inst. of Physiol., Siberian Dept., USSR Acad. of Sciences, Novosibirsk, USSR). 1973. THE RATE OF BASAL METABOLISM IN FISH. J. Ichthyol., 13(3): 430-438.

Direct measurement of the rate of basal metabolism in fish is shown to be possible in principle and absolute values are given for basal metabolism obtained at different temperatures in species differing in the degree of mobility and in oxygen requirements. Rhythmic fluctuations in the rate of respiratory metabolism are noted in the species investigated and their cause is explained. Such indicators of the respiratory function as the volume of ventilation, the coefficient of utilization of oxygen and the frequency of respiration were measured in addition to the rate of respiratory metabolism.

18644. Hickey, Clarence R., Jr., and Herbert M. Austin. 1974. PUGHEADEDNESS IN THE BLUEFISH. N. Y. Fish Game J., 21(2): 188-189, illus.

18645. Graham, L. Kim. 1974. EFFECTS OF FOUR HARVEST RATES ON POND FISH POPULATIONS. In: Symposium on overharvest and mgmt of largemouth bass in small impoundments. N. C. Div. Amer. Fish. Soc., Spec. Pub. 3: 29-38.

Largemouth bass, bluegills, and channel catfish, stocked in 1967 to stimulate a 2-yr-old pond fish population, were harvested each year from 1968 to 1970 at various rates (0, 20, 40 and 60%) and the resulting fish populations were analyzed. The best average bass growth for 1968 and 1969 took place in the 40% harvest ponds. However, because of the large harvest in the 60% harvest ponds, the small numbers of large bass remaining in these ponds in 1970 grew faster than fish in any other ponds. The most desirable bass populations were found in the 40% harvest ponds. The 0 harvest ponds were overcrowded with slow-growing bass, the catchable-size bass in the 60% harvest ponds were practically gone and there was a large buildup of slow-growing, intermediate-size bass. Original stock bass in the 20% harvest ponds grew well but there was a shortage of intermediate-size fish in these ponds. Bluegill populations were similar in all ponds. Their growth above 6 in total length was slow. Catfish did not reproduce successfully in any pond, therefore, their growth was directly proportional to rates of harvest. Standing crops of all fish in harvested ponds in 1968 were highest in the 40% harvest ponds, but the highest standing crops in 1969 and 1970 were found in the 20% harvest ponds. Mortality of adult fish was usually low, with the exception of original stock bluegills in 1968. Many young-of-the-year bluegills were lost at time of fall draining because of aquatic vegetation in some ponds and because of physical stress from draining procedures. Harvest recommendations based on the results of this study and other observations are discussed. (Auth.)

18646. Werner, Earl E. (Dept. of Zool., Univ. of Iowa, Iowa City, Iowa). 1974. THE FISH SIZE, PREY SIZE, HANDLING TIME RELATION IN SEVERAL SUNFISHES AND SOME IMPLICATIONS. J. Fish. Res. Board Can., 31(9): 1531-1536.

The relation between fish size, prey size, and handling time was determined for bluegill (Lepomis macrochirus) and green (L. cyanellus) sunfishes with both artificial and natural prey. When scaled by plotting handling time against the ratio of prey size to mouth size, the relation was quite general across fish size and species and is described by a modified exponential equation. Handling time increases 2-1/2 - 3 fold as fish approach satiation. Curves of handling time/unit return define optimal prey size for fish of different size and/or species and illustrate comparative aspects of the breadth of diet for different sized sunfish. Certain life history features of the bluegill are interpreted on the basis of these curves. Optimal prey size occurs at a prey size to mouth size ratio of 0.59 regardless of fish size. (Auth.)

18647. Platts, William S. 1973. WATER AND LAND PLANNING AND THE FISHERY RESOURCE. Fifty-third Ann. Conf. of the Western Assoc. of State Game and Fish Commissioners, pp. 590-593.

Outlines, procedures and the 13 steps that need to be fulfilled to work fishery and aquatic information input into land use plans to form optimum decisions. (Auth.)

18648. Davis, G. E. (Dept. of Fish. and Wildl., Oregon State Univ., Corvallis, Oregon). 1974. PHASE II: TEMPERATURE REQUIREMENTS OF SALMONIDS IN RELATION TO THEIR FEEDING, BIOENERGETICS, GROWTH AND BEHAVIOR. Oreg. Water Resources Res. Inst., Completion Report, June 30, 1974, 24 p.; Available from NTIS, Springfield, Va. 22161 as PB-234 339 $3.25 in paper copy, $2.25 in microfiche; Selected Water Resources Abstracts, 7(20): p. 41.

Model stream ecosystems were used to evaluate the effect of a moderate increment of temperature change (4C) on the survival, growth and production of juvenile chinook salmon, Oncorhynchus tshawytscha, and on the abundance of the stream invertebrates. Growth rates were not greatly different between the heated and control stream but, because of higher survival rates, values of annual production were markedly greater in the control than in the heated stream. The abundance of food organisms, especially the mayflies and stoneflies, was greater and the number of kinds was greater in the control than in the heated stream. Laboratory studies defined relationships between rates of growth and food consumption for juvenile steelhead trout, Salmo gairdneri, kept as ambient and at elevated (3 and 6C) fluctuating temperatures during different seasons. Decelerating curvilinear relationships were defined in most experiments. At low rates of food consumption temperature increase reduced growth rates. As consumption rate increased curves defined for control and elevated temperatures tended to converge. Food consumption rates of trout in a natural stream were estimated by comparing the fishes' growth rates with those of fish kept in the laboratory at known rations. Results suggested that if food availability remained unchanged, increase of temperature above normal seasonal temperatures would decrease growth rates of trout in their natural environment.

18649. Dolan, J. Michael, III, Bentley C. Gregg, John Cairns, Jr., Kenneth L. Dickson, and Albert C. Hendricks (Dept. of Biol. and Center for Environ. Studies, Virginia Polytech. Inst. and State Univ., Blacksburg, Virginia 24061). 1974. THE ACUTE TOXICITY OF THREE NEW SURFACTANT MIXTURES TO A MAYFLY LARVAE. Arch. Hydrobiol., 74(1): 123-132.

The individual toxicity of linear dodecyl benzene sulfonate (DBS), linear tridecyl benzene sulfonate (TBS), and a nonionic surfactant (a blend of two primary alcohol ethoxylates) to mayfly larvae (Isonychia sp.) were determined using static bioassays. Specimens were maintained for one week at 8-10° C with a photoperiod of 12L:12D and 40-70 ft. candles illumination in dechlorinated Blacksburg tap water (hardness = 50-60 mg/l). Tests were carried out in 3.8 liter glass jars containing a final test volume of 2.0 liters. Logarithmic - probability regression lines, EC_{50} and ET_{50} values were obtained using the BMD computer program and confidence limits, slopes and slope parallelism significance were determined using the Litchfield-Wilcoxon method. Results follow: for DBS 96 hr EC_{50} = 5.33 mg/l (Litchfield-Wilcoxon confidence limits 4.23-672); TBS 96 hr EC_{50} = 1.36 (1.06-1.76; nonionic blend 96 hr EC_{50} = 2.96 (2.44-3.58). At 18.0 mg/l the ET_{50} values were: DBS = 1230 min. (946-1598); TBS = 231 (202-264); nonionic blend = 685 (600-782). The main value of these preliminary tests was to determine the relative toxicity of each of the test materials under comparable conditions. (Authors)

18650. Gordon, Bernard L. (Northeastern University, Boston, Massachusetts). 1974. MARINE CAREERS. The Book and Tackle Shop, Watch Hill, Rhode Island, 42 p., price $1.00.

18651. Parsons, L. S., and J. A. Moores (Dept. of the Environ., Fish., and Mar. Serv., Biol. Sta., St. John's, Newfoundland A1C 5X1, Canada). 1974. LONG-DISTANCE MIGRATION OF AN ATLANTIC MACKEREL (Scomber scombrus). J. Fish. Res. Board Can., 31(9): 1521-1522.

The recapture south of Long Island of an Atlantic mackerel (Scomber scombrus) tagged in Newfoundland waters represents a migration of at least 2259.6 km (1400 miles), the farthest documented migration of mackerel ever reported from the Northwest Atlantic. This recapture supports earlier tagging evidence that overwinter mixing may occur between the northern and southern populations of mackerel. (Authors)

18652. Schnick, Rosalie A. (U. S. Fish & Wildlife Serv., Fish Control Lab., La Crosse, Wisconsin 54601). 1974. A REVIEW OF THE LITERATURE ON THE USE OF ANTIMYCIN IN FISHERIES. FWS/LR-74/01, 109 p., PB-235 440/5WJ paper copy $4.50, microfiche $2.25.

Antimycin has been used as a piscicide for a decade. It is effective in very minute concentration (0.5 to 10 micrograms/liter) against all life stages of fish, but with a wide range of specificity between certain species. Thus, it can be used in selective, partial, or spot treatments. Other desirable characteristics of antimycin include irreversible action, nonrepellency to target fish, lack of color and odor in water, and rapid natural degradation. If needed, it can be detoxified easily by potassium permanganate or chlorine and removed by activated carbon. The activity of antimycin is impaired significantly by high pH and to a lesser extent by low temperature. Piscicidal concentrations of antimycin are relatively harmless to other aquatic life, waterfowl, and mammals.

18653. Kovalev, P. M. (Novgorod Pedagogical Inst., USSR). 1973. NATURAL REPRODUCTIVE CONDITIONS OF THE PIKE-PERCH [Lucioperca lucioperca (L.)], PERCH [Perca fluviatilis (L.)] AND RUFFE [Acerina cernua (L.)] OF LAKE ILMEN. J. Ichthyol., 13(6): 943-946.

18654. Pessah, E., and P. M. Powles (Dept. of Zool., Queen's Univ., Kingston, Ontario, Canada). 1974. EFFECT OF CONSTANT TEMPERATURE ON GROWTH RATES OF PUMPKINSEED SUNFISH (Lepomis gibbosus). J. Fish. Res. Board Can., 31(10): 1678-1682.

Relative growth rates of fall-captured Lepomis gibbosus exposed to six constant temperature regimes (5-30 C) were clearly separable for the first 6 wk. Thereafter, growth declined, becoming uniform between 15 and 30 C, and linear and negative at 10 and 5 C, respectively. A growth model between 15 and 30 C emerged as follows: 0-4 wk, rapid; 5-10 wk, intermediate; 11-16 wk, low uniform. The initial high followed by the low uniform stanza suggests "growth acclimation" took place. (Authors)

18655. Clark, Robert C., Jr., and John S. Finley (National Mar. Fish. Serv., Northwest Fish. Center, Seattle, Washington 98112). 1974. TIDAL AQUARIUM FOR LABORATORY STUDIES OF ENVIRONMENTAL EFFECTS ON MARINE ORGANISMS. Prog. Fish-Cult., 36(3): 134-137.

A small recycling tidal aquarium system for the laboratory study of petroleum pollution uptake by marine organisms is described. The bioassay test chamber is constructed to minimize extraneous hydrocarbon contamination. While it is designed for use by facilities without running seawater to study oil slick effects on small intertidal organisms, it would be adaptable for use in a wide range of laboratory studies of environmental pollution experiments. (Authors)

18656. Rasmussen, Jerry L., and Stanley M. Michaelson. 1974. ATTEMPTS TO PREVENT LARGEMOUTH BASS OVERHARVEST IN THREE NORTHWEST MISSOURI LAKES. In: Symposium on overharvest and mgmt of largemouth bass in small impoundments, N. C. Div. Amer. Fish. Soc., Spec. Pub. No. 3, 69-83.

Attempts to prevent largemouth bass overharvest in small northwest Missouri lakes led to the use of 12-in. length limits in October, 1968. In every case this regulation resulted in stock-piling of bass under the length limit and bluegill populations declining in numbers. The length of time before this problem became severe was related to basic fertility, forage availability and competing predator species. Gizzard shad introductions at these lakes have shown promise in improving bass growth and stabilizing bluegill populations. The greatest benefit provided by the length limit is the large number of bass it provided for the sport fishery. Creel censuses indicate that the catch and release of stock-piled bass provides a great deal of enjoyment for the casual fishermen. (Authors)

18657. Spence, Liter E., Jr. (Mont. Fish & Game Dept., Ovando, Montana 59854). 1974. AN INEXPENSIVE SURFACE WATER DISSOLVED OXYGEN SAMPLER. Prog. Fish-Cult., 36(1): p. 26.

18658. Stewart, D. J., and R. A. Stein (NMFS, Great Lakes Fish. Lab., Ann Arbor, Michigan). 1974. SHORT TERM FATE OF DIETARY DIELDRIN IN THE DIGESTIVE TRACT OF JUVENILE LAKE TROUT (Salvelinus namaycush). Bull. Environ. Contamin. Toxicol., 11(6): 563-566; Selected Water Resources Abstracts, 7(21): p. 52.

The short term fate of an oral dose of dieldrin in the digestive tract of lake trout was examined by injecting food contaminated with about 1.05 ppm of dieldrin directly into the stomach. Trout were sacrificed at intervals to determine the location of dieldrin in the gut. The decline of dieldrin in the stomach paralleled the decline in the amount of food and little or no dieldrin was found in the intestine. This indicates a rapid uptake or degradation of dieldrin in the pyloric caecal region and demonstrated, under these experimental conditions, that defacation of dieldrin is minimal.

18659. O'Brien, W. John, and Gary L. Vinyard (Dept. of Systematics and Ecol., Univ. of Kansas, Lawrence, Kansas 66045). 1974. COMMENT ON THE USE OF IVLEV'S ELECTIVITY INDEX WITH PLANKTIVOROUS FISH. J. Fish. Res. Board Can., 31(8): 1427-1429.

Application to natural fish populations of Ivlev's equation of electivity, by which the degree of choice a predator exhibits in its feeding behavior is determined by comparing the proportion of a particular prey species present in the environment with the proportion present in the gut, has frequently depended upon the incorrect assumption that both predaceous fish and their zooplankton prey are evenly or randomly distributed throughout a water body. In fact, zooplankton tend to clump both vertically and horizontally, and the use of a vertically towed net to determine zooplankton density does not accurately indicate the zooplankton species composition available to a fish feeding at a particular location. Certain zooplankton sampling equipment also may show selectivity or may not capture particular species, so that a difference between the percent species composition of the plankton sample and that of the fish gut may be due to sampling bias rather than fish electivity. Consideration of these problems will enable field researchers to gather more accurate data concerning fish feeding electivity. (Authors)

18660. Anderson, R. S., and Linda G. Raasveldt (Biol. Dept., Univ. of Calgary, Calgary, Alberta, Canada T2N 1N4). 1974. Gammarus PREDATION AND THE POSSIBLE EFFECTS OF Gammarus AND Chaoborus FEEDING ON THE ZOOPLANKTON COMPOSITION IN SOME SMALL LAKES AND PONDS IN WESTERN CANADA. Canadian Wildlife Serv., Occasional Paper No. 18, 21 p.

In the lakes and in laboratory experiments Gammarus lacustris lacustris adults captured and ate several invertebrate species with which these amphipods commonly co-occur. In the laboratory, they also readily ate species with which they do not co-occur in the waters studied. Experimental evidence and data from 52 aquatic communities suggest that Gammarus predation may be an important reason why Gammarus seldom, if ever, co-occurs with anostracans, and why co-occurrences of G. l. lacustris and Chaoborus spp. were rare in the waters investigated. The relative abundance of these two genera and their diurnal limnetic occurrence in fish-free lakes greatly influenced the abundance of certain aquatic invertebrates and the species composition of the invertebrate communities. (Authors)

18661. Suvorova, Ye. G., and L. I. Teshchuk (Central Res. Lab. of the Medical Inst., Irkutsk, USSR). 1973. MORPHOLOGY AND HISTOCHEMISTRY AT THE GASTRO-INTESTINAL TRACT OF THE BAIKAL WHITE GRAYLING [Thymallus arcticus baicalensis (Dyb.)]. J. Ichthyol., 13(3): 438-448.

Results are presented from a histo-morphological study of the gastro-intestinal tract of the white grayling (Thymallus arcticus baicalensis Dyb.) in periods of physiological fasting and active feeding. Ecological and morphological structural characteristics of the alimentary canal are established. Histo-chemical methods were used for the research. A qualitative assessment is made of the accumulation and distribution of mucopolysaccharides in the epithelium and connective tissue of the gastro-intestinal tract of the white grayling in different physiological states.

18662. Marking, Leif L. (U. S. Fish and Wildlife Serv., Fish Control Lab., La Crosse, Wisconsin 54601). 1974. TOXICITY OF THE SYNTHETIC PYRETHROID SBP-1382 TO FISH. Prog. Fish-Cult., 36(3): 144.

The pyrethroid SBP-1382^{R} (5-benzyl-3-furyl ester of chrysanthemate) is highly toxic to fish and may be useful as a piscicide under conditions in which other toxicants are ineffective. The 96-hour LC50's (concentrations producing 50-percent mortality) ranged from 1 to 5 µg/l of pyrethrin for coho salmon (Oncorhynchus kisutch), chinook salmon (Oncorhynchus tshawytscha), rainbow trout (Salmo gairdneri), lake trout (Salvelinus namaycush), brook trout (Salvelinus fontinalis), carp (Cyprinus carpio), white sucker (Catostomus commersoni), green sunfish (Lepomis cyanellus), bluegill (Lepomis macrochirus), and yellow perch (Perca flavescens). Toxicity increased as temperature decreased, but was not influenced by changes in pH or water hardness. (Auth.)

18663. Steffens, W. Dr. habil (Inst. fur Binnenfischerei, Berlin-Friedrichshagen, GDR). 1974. THE MOMENT OF ONSET OF SEXUAL RIPENESS IN RAINBOW TROUT (Salmo gairdneri) AND ITS ECONOMIC IMPORTANCE. (Der Zeitpunkt des Eintritts der Geschlechtsreife bei Regenbogenforellen (Salmo gairdneri) und seine wirtschaftliche Bedeutung). Z. Binnenfischerei DDR, 21(9): 249-280. In German.

18664. Ming, Arvil. 1974. REGULATION OF LARGEMOUTH BASS HARVEST WITH A QUOTA. In: Symposium on overharvest and management of largemouth bass in small impoundments; N. C. Div. Amer. Fish. Soc., Spec. Pub. 3:39-53.

A 40% harvest for bass over a 4-yr period in the 9.5 A Pony Express Silt Basin removed a total of 705 largemouth bass, and 686 bluegills. Average annual fishing pressure was 751 hr, (270 trips) and a total average catch of 856 fish at average annual rates of 79 hr/A and 28 trips/A. The lake remained open an average of only 4.2 days annually. Population estimates for largemouth bass during four seasons were 632 in 1967, 352 in 1968, 260 in 1969 and 436 in 1970. Population estimates of stocked bass indicated only 46 stocked bass were left in the lake after the 1970 harvest and 326 bass were recruited into the 9-in size class or larger during 1969. Estimated bass mortalities over the 4-yr period, 10.7% in 1967, 19.3% in 1968 and 15.4% in 1969, were used to calculate an expected stocked bass population of 56 bass left in the lake which compared closely with the previous estimate of 46 fish. Age and growth data indicated good growth for largemouth bass at rates higher than those in larger, nearby Pony Express Lake. Bluegill growth was very fast in the Silt Basin and exceeded rates found at four 200-A lakes. The 40% harvest quota of largemouth bass maintained a balanced fish population that showed good growth of both the bass and bluegills. Good fishing was still being provided even after four seasons of fishing pressure in excess of 250 trips per year. However, a quota of 40%/yr, at least in lakes 10 A in size and stocked at 100 bass/A, is the maximum harvest that should be used. This harvest rate should be maintained for at least 6 yr after the fish are stocked, or 4 seasons after being open to fishing, to allow substantial recruitment of sexually mature bass to a harvestable size. It must be stressed that 40% of a harvestable largemouth bass population can be removed in a short time span. (Auth.)

18665. Kempf, Charles T., and Donald K. Underhill (Dept. of Zool., Rutgers Univ., New Brunswick, New Jersey 08903). 1974. A SERUM ESTERASE POLYMORPHISM IN Fundulus heteroclitus. Copeia, No. 3, pp. 792-794.

This note describes the variation at a serum esterase locus in adult killifish from central New Jersey.

18666. Shcherbukha, A. Ya. (Inst. of Zool., Ukrainian Acad. of Sci., Kiev, USSR). 1973. SPECIES, SIZE, AND AGE DISTRIBUTION IN NORTHERN DONETS FISHES IN THE AREA OF DISCHARGE OF WARM-WATER EFFLUENTS FROM THE LUGANSK POWER STATION. Hydrobiol. Journal, 9(3): 36-41.

The changes in the species composition of the ichthyofauna of the Northern Donets in the region of discharge of the warm water from the Lugansk Power Station are described. A relationship is domonstrated between the species of fish, their size, and their age in commercial catches. Measures are described for restoring stocks of fish in this sector of the river. (Auth.)

18667. Yoneda, Tsutomu, and Yoshio Ishihara (Lab. of Polymer Chem. of Mar. Products, Fac. of Fish., Hokkaido Univ., Hakodate, Japan). 1973. DISC ELECTROPHORETIC PATTERNS OF THE BLOOD SERUM PROTEINS FROM CHUM SALMON, Oncorhynchus keta AND CHERRY SALMON, Oncorhynchus masou. Bull. Fac. Fish., Hokkaido Univ., 24(2): 76-89. In Japanese.

There are some reports on electrophoresis of salmon sera using filter paper, starch gel or cellulose acetate membrane as support, but not on disc electrophoresis by acrylamide gel in detail. We believe that the fine resolution of serum proteins of fish by this method may contribute to the study of population genetics and to the blood assay of physiological changes. The procedure of acrylamide gel disc electrophoresis was that of Ornstein and Davis with some modifications; it was possible to substitute forty percent of saccharose solution of sample gel. We found almost all the proteins of serum could be stained visibly with amido black dyeing using two microliters of serum for a gel column, and that better separation was obtained at pH 9.4. In the present report two species of salmon, Oncorhynchus keta and Oncorhynchus masou, were used and their disc electrophoretic profiles are exhibited. We found some, maybe three, typical patterns especially of the globulin fractions alone of disc electrophoresis of sera of one species, O. keta or O. masou, and observed some variation between different typical patterns. From these results it is possible to consider the presence of some genetic groups in a species of salmons or to determine what pattern is the typical one belonging to the normal sera for a species of fish. (Authors)

18668. Goodwin, M. H., and C. I. Goddard (Dept. of Zool., Univ. of Toronto, Toronto, Ontario, Canada). 1974. AN INEXPENSIVE MULTIPLE LEVEL WATER SAMPLER. J. Fish. Res. Board Can., 31(10): 1667-1668.

An inexpensive nonmetallic water sampler was designed to secure multiple samples simultaneously from different depths. The device is constructed of readily available materials and may be operated from a small boat. (Authors)

18669. Korycka, Anna, and Wiktor Dembinski (Inst. Rybactwa Srodladowego w Olsztynie, Zaklad Hydrobiologii i Zaklad Techniki Rybackiej, Poland). 1974. WATER CONDUCTIVITY IN THE LAKES OF NORTHERN POLAND. (Przewodnosc Elektryczna Wlasciwa Wody Jezior Polnocnej Polski). Roczniki Nauk Rolniczych, Vol. 96, No. 2, pp. 59-74. In Polish.

Water conductivity was determined in 1200 lakes situated in the Northern Poland. The water conductivity was stated to be from 30 to 3700 μS/cm. In the majority of the investigated lakes the water conductivity was from 200 to 300 μS/cm. In general, it was higher in the springtime, and the changes from the spring to summer did not exceed 50 μS/cm. (Authors' synopsis)

18670. Baldini, I., and F. Cugurra (Lab. Provinciale di Igiene e Profilassi, Istituto di Farmacologia e Farmacognosia-Gruppo di Studio Ecologico, Univ. Genova, Italia). 1974. ICHTHYOTOXIC EFFECTS OF SOME ANTI-POLLUTION PRODUCTS. Water Research, Vol. 8, No. 5, pp. 323.

A study has been carried out on the ichthyotoxicity effects of 14 anti-pollution products used for the dispersion of hydrocarbons in water, on the Carassius auratus. The better tolerated products are Esso Corexit 8666 and 7664; followed by Fina Sol OSR/2 and SC whilst the other products were found to contain higher ichthyotoxicity characteristics. (Authors)

18671. Rowe-Rowe, D. T. 1974. LABORATORY AND FIELD TESTS IN THE REVIVAL OF FISH AFFECTED BY ROTENONE. J. Sth. Afr. Wildl. Mgmt Assoc., 31(1): 19-21.

Various methods of reviving fish affected by rotenone were tested in the laboratory. The most successful method was simply to transfer affected fish to fresh water, as rapidly as possible after they lost equilibrium due to the rotenone. An alternative successful method was to add potassium permanganate simultaneously with the rotenone. These two methods, which gave success in the laboratory, also proved to be effective in the field. (Auth.)

18672. Schroeder, Gerald L. 1973. FACTORS AFFECTING FEED CONVERSION RATIO IN FISH PONDS. Bamidgeh, 25(4): 104-113.

A group of 26 commercial fish ponds was studied to determine factors affecting the efficiency with which supplemental feed (sorghum and/or protein-enriched pellets) was utilized. Food was supplied to all ponds according to a standard formula widely used in Israel that takes into account standing stock, weight and type of fish in the pond. The ponds are arranged in a flow-through chain; residence time of the water in the individual ponds varied from less than one week to several months. Pond waters contained 1900 to 2700 ppm dissolved solids with 850 to 1400 Cl. Concentrations of several chemicals found in the pond bottom soils decreased with increasing depth indicating that the chemicals do not enter the pond water from the pond bottom. Zooplankton concentration in pond water varied from 0.1 to 2.0 mg/l and were related to residence time of the water in the pond system. On similar exposure to light for 2 weeks all the pond waters produced, and sustained similar plankton concentrations. A weak correlation between feed conversion ratio (FCR) and types of fish stocked in the pond was found. A strong correlation was found between FCR and zooplankton concentration in the range of 0.1 and 1.1 mg per liter pond water. In this range natural feed concentrations are the main factor governing the efficiency with which the supplemental feed is used by the fish. At higher zooplankton concentrations there may have been an excess of total food (natural plus supplemental) in the pond. No correlation existed for stocking density (range 1000 to 5000 kg fish per hectare) and FCR or for size of fish initially stocked and FCR, indicating that the feeding formula compensates for changes in these variables. (Auth.)

18673. Neproshin, A. Yu. (A. N. Severtsov Inst. of Evol. Morphol. and Animal Ecol., USSR Acad. of Sciences (IEMEZh), Moscow, USSR). 1973. THE SIZING OF SALMON BY THEIR SOUNDS. J. Ichthyol., 13(6): 949-952.

18674. Redmond, Lee C. 1974. PREVENTION OF OVERHARVEST OF LARGEMOUTH BASS IN MISSOURI IMPOUNDMENTS. In: Symposium on overharvest and management of largemouth bass in small impoundments, N. C. Div. Amer. Fish. Soc., Spec. Pub. No. 3: 54-68.

Initial harvest of largemouth bass in Missouri's public fishing lakes has been very high. It varied from 11 to 69% of the adult population during the first 4 days of fishing in lakes of 20 to 205 acres. This has been the primary cause of low adult bass populations, resulting low-quality bass fishing, and high numbers of slow-growing, intermediate-size bluegills. Creel census records revealed that even a very low daily creel limit of bass would not significantly reduce the initial numbers harvested. Various techniques were tried in several lakes to spread the harvest over a longer period of time to provide better bass fishing and, through heavier predation by the remaining bass population on the bluegills, to produce better bluegill growth and better bluegill fishing. The techniques used were: a "fish for sport only" season prior to lake opening, leaving a lake open to fishing from time of original stocking, mid-winter openings, refuge areas, 40% bass harvest quota, and length limits on bass. A minimum length limit on bass combined with staggering the initial stocking of forage fishes and stocking several sizes of bass appears to be the best technique found. Creation of a large forage base prior to stocking a reduced number of bass fingerlings, a few adult bass, the normal rate of sunfish, and a later addition of bass fingerlings has resulted in rapid growth of the bass, bass reproduction the following year, and the presence of a broad length frequency range of bass when the lake is opened to fishing approximately 2 yr later. A minimum size limit of 14 or 15 in on bass to allow an immediate harvest of 1/4 to 1/3 of the original stock has resulted in continuous good bass and bluegill fishing for at least 5 yr. (Auth.)

18675. Thibault, Roger E. (Ecol. Sect., U-43, Biol. Sci. Group, Univ. of Connecticut, Storrs, Connecticut 06268). 1974. GENETICS OF CANNIBALISM IN A VIVIPAROUS FISH AND ITS RELATIONSHIP TO POPULATION DENSITY. Nature, 251(5471): 138-140.

18676. Hara, Toshiaki J. (Dept. of the Environ., Fish. and Mar. Serv., Fresh-Water Inst., Winnipeg, Manitoba R3T 2N6, Canada). 1974. IS MORPHOLINE AN EFFECTIVE OLFACTORY STIMULANT IN FISH? J. Fish. Res. Board Can., 31(9): 1547-1550.

Morpholine was designated as olfactorily nonstimulatory in rainbow trout as studied electrophysiologically. The morpholine-effect caused by 1% solution differs in many respects from the normal olfactory bulb response, suggesting a mechanism not directly associated with the normal olfactory function. Furthermore, 1% morpholine inhibits the olfactory sensitivity. (Auth.)

18677. Ciepielewski, Wladyslaw (Inst. Rybactwa Srodladowego, Zaklad Ichtiologii, Olsztyn-Kortowo, Poland). 1974. RELATIVE NUMBERS OF FISH WITHIN AGE GROUPS OF Coregonus albula IN THE LAKE MAROZ. (Wzgledne Liczebnosci Rocznikow Sielawy w Jeziorze Maroz). Roczniki Nauk Rolniczych, 96(1): 31-47.

Estimation of relative numbers of Coregonus albula within age-groups was performed on the basis of results of experimental and commercial catches. The relative number of fish within several age-groups was estimated. The results obtained proved the fish of the age-group 1966 to be almost eight times more numerous than that of 1964 or 1967. A method for estimation of relative numbers of Coregonus albula at the age of 1+ was suggested. (Auth.'s synopsis)

18678. Lientz, Joe C., and Charlie E. Smith. (U.S. Fish & Wildl. Serv., Fish Cultural Development Center, Bozeman, Montana 59715). 1974. SOME HEMATOLOGICAL PARAMETERS FOR HATCHERY-REARED CUTTHROAT TROUT. Prog. Fish-Cult., 36(1): 49-50.

18679. Hamilton, Sandra E. (NMFS, Great Lakes Fishery Lab., Ann Arbor, Michigan). 1974. A REVIEW OF THE LITERATURE ON THE USE OF BAYLUSCIDE IN FISHERIES. FWS/LR-74/02; PB-235 441/3WJ, paper copy $4.00, 78 p., $2.25 microfiche.

In the United States bayluscide has had multiple uses. The 70% wettable powder has been used in Puerto Rico for snail control and the 5% granular formulation has been tested in Michigan and Wisconsin against freshwater snails serving as intermediate hosts of the trematode causing swimmers' itch. Bayluscide has also been used in field trials as a fish toxicant. Its most important use in North America, however, has been to control sea lampreys, Petromyzon marinus, in the Great Lakes, a necessary prerequisite for the restoration of Great Lakes sport and commercial fisheries. Since 1966 the 5% granular formulation has been used by the U.S. Fish and Wildlife Service and the Canadian Department of Environment as a toxicant to survey populations of larval sea lampreys in Great Lakes estuaries and deepwater tributaries. The Canadian Government also uses bayluscide to control sea lampreys, but in the United States the present registration restricts use to population surveys only.

18680. May, B. E. (Utah Wildl. Resources, Lake Powell Fishery Investigations, Page, Arizona). 1973. SEASONAL DEPTH DISTRIBUTIONS OF RAINBOW TROUT (Salmo gairdneri) IN LAKE POWELL. Reprint: Proc. Utah Acad. of Sciences, Arts and Letters, 50(2): 64-72.

Knowledge of spatial distributions of fish within the water column and understanding factors effecting this distribution are necessary to adequately manage a limnetic fishery. Gill nets set vertically and horizontally so that depth of capture can be determined have been used successfully. Horak and Tanner (1964), utilizing vertical gill nets, studied summer distribution of four species in a Colorado reservoir. Vertically suspended gill nets have been used to study fish distributions in Lake Mendota, Wisconsin (Wisby, 1955 and Tibbles, 1956). Lackey (1970) successfully utilized vertical and horizontal gill nets to study seasonal changes in depth distribution of (Salvelinus fontinalis), landlocked alewives (Alosa pseudoharengus), and American smelt (Osmerus mordax) in a small Maine lake. Distribution of white catfish (Ictalurus catus) and rainbow trout (Salmo gairdneri) was studied by von Geldern (1964) in Folsom Lake, California. The purpose of this study was to determine depth distribution of rainbow trout in lower Lake Powell. Water temperature, dissolved oxygen, and food availability were measured to evaluate their effects upon vertical distribution. (Auth.)

18681. Megard, R. O. (Limnological Res. Center, Minnesota Univ., Minneapolis, Minnesota). 1974. LIMNOLOGY OF LAKE MINNETONKA. Dept. of Ecol. and Behavioral Biol., Interim Report No. 11, 45 p, available from NTIS, Springfield, Virginia 22161 as PB-234 322, $5.50 paper copy, $2.25 microfiche; Selected Water Resources Abstracts, 7(20): p. 41.

Fluctuations of population densities of phytoplankton in 4 basins of Lake Minnetonka in Minnesota were inferred from changes of concentrations of chlorophyll a and particulate organic carbon during the ice-free season. Concentrations of chlorophyll a during 1972 and 1973 were similar to those during 1968 and 1969 except in the lake's largest basin, where concentrations during 1972 and 1973 were only about 50% as high as during 1968 and 1969. The decrease of chlorophyll is attributable to the reduced influx of phosphorus, which decreased from about 13 metric tons/year because sewage effluents were diverted away from the basin during the winter of 1971-1972. The decrease of chlorophyll coincided with lower concentrations of total phosphorus. The average quantity of phosphorus in the Lower Lake decreased from 13 metric tons in 1968 and 1969 to 10 metric tons in 1973, and the average concentration of total phosphorus decreased from 62 mg m-3 to 47 mg m-3. The decrease between 1969 and 1973 is 42% of the decrease that will be required to reach the new steady state concentration of 26 mg m-3 that is expected to be achieved by 1977. The loss of phosphorus through the outlet of Lake Minnetonka is negligible. Most of the phosphorus lost from the water since 1971 must have been deposited in the sediments. The net rate of phosphorus sedimentation is almost 0.5 g m-2 yr-1.

18682. Oren, O. H. (Israel Oceanographic and Limnological Research, Ltd., Haifa, Israel). 1974. IBP/PM INTERNATIONAL SYMPOSIUM ON THE GRAY MULLETS AND THEIR CULTURE: AFTERMATH AND REFLECTIONS. Bamidgeh, 26(2): 23-27.

18683. Volkova, L. A. (Baikal Biol. Sta., Biol. and Geograph. Res. Inst., Irkutsk Univ., B. Koty, Listvenichnoe Postal District, Irkutsk Province, USSR). 1973. THE EFFECT OF LIGHT INTENSITY ON THE AVAILABILITY OF FOOD ORGANISMS TO SOME FISHES OF LAKE BAIKAL. J. Ichthyol., 13(4): 591-602.

Alteration in the availability of food organisms to the Baikal omul [Coregonus autumnalis migratorius (Georgi)] and the yellowfin Baikal sculpin [Cottocomephorus grewingki (Dyb.)] in different stages of ontogeny, and also to the sand sculpin [Paracottus kessleri (Dyb.)], the minnow [Phoxinus phoxinus (L.)] and the pike (Esox lucius L.) as a function of light intensity was studied under experimental conditions. We determined threshold values of light intensity, the lowest values of light intensity for the commencement of active feeding and the maximum feeding rate of these fishes. The role of vision in the feeding of the fishes investigated was established.

18684. Falk, M. R., D. V. Gillman, and L. W. Dahlke. 1974. DATA ON THE BIOLOGY OF LAKE TROUT FROM GREAT BEAR AND GREAT SLAVE LAKES, NORTHWEST TERRITORIES, 1973. Dept. of the Environ., Fish. and Marine Serv., Data Report Series No. CEN/D-74-4, 39 p.

18685. Linko, R. R., J. Kaitaranta, P. Rantamaki, and L. Eronen (Dept. of Biochem., Univ. of Turku, Turku 50, Finland). 1974. OCCURRENCE OF DDT AND PCB COMPOUNDS IN BALTIC HERRING AND PIKE FROM THE TURKU ARCHIPELAGO. Environmental Pollution, 7(3): 193-207.

The contamination of Baltic herring and pike from six different areas of the Turku archipelago (the southwestern coast of Finland) with DDT and its metabolites DDE and DDD, and PCB's (polychlorinated biphenyls) was studied. Herring muscle contained an average 0.38 ppm Σ DDT and 0.31 ppm PCB's on a fresh tissue basis. However, the values obtained for individual fish specimens showed large variations, depending mainly on the differences in the fat content of the fish. The range of DDT and PCB concentrations in herring from the Turku archipelago was similar to that found in herring from the Gulf of Bothnia. Pike muscle contained on average only 0.04 ppm DDT compounds and 0.05 ppm PCB's on a fresh weight basis. The

results show local differences in the residue concentration of the fish. The chlorinated hydrocarbons were found to accumulate in the liver and ovary of the pike and, to a lesser degree, in the testis and kidney. In the ovary fat the $\sum$ DDT concentration rose to 100 ppm and that of PCB's to 190 ppm. (Authors)

18686. Stanley, J. G., and K. E. Sneed (Fish Farming Exp. Sta., P. O. Box 860, Stuttgart, Arkansas 72160). 1973. ARTIFICIAL GYNOGENESIS AND ITS APPLICATION IN GENETICS AND SELECTIVE BREEDING OF FISHES. Reprint: "The Early Life History of Fish," Proc. of International Symposium held at Dunstaffnage Mar. Res. Lab. of the Scottish Mar. Biol. Assoc. at Oban, Scotland from May 17-23, 1973, pp. 527-536.

Gynogenesis is potentially valuable for providing unisex populations, in genetic studies and selective breeding for locating and selective breeding for locating and selecting recessive genes and in studies of chromosome linkage and crossovers. Gynogenesis is especially useful in selective breeding, since homozygosity may be achieved in fewer generations than with inbreeding. The grass carp (Ctenopharyngodon idella) was used as a test animal. Gynogenetic fry were produced by treating grass carp eggs with x-irradiated goldfish (Carassius auratus) sperm. A total of 185 embryos hatched of which 34 were presumed diploid out of 40,000 eggs which had received a 2°C temperature shock. No embryos were found in controls. Offspring produced by gynogenesis could theoretically reproduce if the female of the species has heterogametic sex chromosomes or if spontaneous sex inversions occur. We conclude that production of gynogenetic fishes offers a means for stocking exotic species without the likelihood of reproduction. (Authors' summ.)

18687. Hattula, Marja Liisa (Dept. of Chem., Univ. of Jyväskylä, Jyväskylä, Finland). 1974. SOME ASPECTS OF THE RECOVERY OF CHLORINATED RESIDUES (DDT-TYPE COMPOUNDS AND PCB) FROM FISH TISSUE BY USING DIFFERENT EXTRACTION METHODS. Bull. Environ. Contamin. Toxicol., 12(3): 301-307.

18688. Karpevich, A. F., and A. T. Shurin (All-Union Res. Inst. for Sea Fish. and Oceanogr. (VNIRO), Moscow, USSR). 1973. THE EFFECT OF DIFFERENT SALINITIES AND MANGANESE ION ON THE SURVIVAL AND RESPIRATION OF THE BALTIC FLOUNDER [Pleuronectes flesus trachurus (Dunker)] OF THE GULF OF RIGA. J. Ichthyol., 13(5): 753-763.

The effect of different salinities and of manganese on the survival and respiration of juvenile Baltic flounders (Pleuronectes flesus trachurus Dunker) was investigated. The overall salinity range and the lower lethal limits have been established. The fish were kept in solutions of manganese chloride prepared with natural water from the Gulf of Riga. The penetration of manganese into all the organs and body fluids of the flounder was established by the method of neutron cavitation analysis (after irradiation of tissue and organ samples of the flounders in a reactor neutron flux). Its flow is slight in weak manganese solutions (up to 7.5 mg/liter) and the flounder succeeds in eliminating excess manganese. At concentrations above 12 - 17 mg/liter manganese accumulates in vitally important organs (heart, liver, gonads), as a result of which metabolic processes are disturbed and the fish die.

18689. Vestergard Jørgensen, P. E. 1974. INDIRECT FLUORESCENT ANTIBODY TECHNIQUES FOR DEMONSTRATION OF TROUT VIRUSES AND CORRESPONDING ANTIBODY. Acta vet. Scand. L5: 198-205; Fish Health News, 3(4): 12.

Two variations of the indirect fluorescent antibody technique (FAT) have been utilized in the work concerning two important virus disease of trout, viral haemorrhagic septicaemia (VHS) and infectious pancreatic necrosis (IPN). A "two layer" indirect FAT allowed demonstration of the respective viruses in cell cultures and a "three layer" indirect FAT allowed demonstration of trout antibody to the viruses. Antibody, by means of the latter technique, could be deomonstrated only in artificially immunized trout. (Auth.)

18690. Thomann, Robert V., Daniel S. Szumski, Dominic M. DiToro, and Donald J. O'Connor. (Manhattan College, Bronx, New York). 1974. A FOOD CHAIN MODEL OF CADMIUM IN WESTERN LAKE ERIE. Water Research, 8(10): 841-849.

The simple food chain model illustrated here could prove useful in large scale planning applications provided additional data are collected on the various trophic levels. The model demonstrates the increase in concentration of potentially toxic substances, such as cadmium, as one proceeds up the food chain. The food chain model also illustrates how interactive modeling between complex non-linear and linear compartment model can be accomplished. The problem of verification and data availability are highlighted by the model: estimates of transfer rates and biomass of different trophic levels must be on hand. This model therefore is an example of a modeling structure that is still in an early stage of development; hence the reliance on linear kinetics rather than possibly more realistic non-linear mechanisms. Nevertheless, the spatial-trophic level structure of the model indicates the general behavior of a toxicant such as cadmium when released into the water environment. (Authors)

18691. Brinkhurst, R. O., L. Linkletter, S. Connors, and A. Hamilton. 1974. A BIBLIOGRAPHY OF CANADIAN ATLANTIC COAST ESTUARY STUDIES. Environ. Canada, Fish. and Mar. Serv., Technical Report No. 482, 23 p. Manuscript status.

A bibliography of Canadian Atlantic coast estuary studies is presented in alphabetical order, with a numerical index to these by geographical area. A few general works have been included to provide access to the global literature that provides the context in which these studies are performed. (Authors)

18692. Mann, H., and H. Stache (Inst. für Küsten- und Binnenfischerei der Bundesforschungsanstalt für Fischerei, Hamburg, und den Chemischem Werken Hüls, Marl, West Germany). 1974. EFFECT OF A MIXTURE OF SUCCINIC ACID MONO-SULPHO-ESTER AND OLEFIN SULFONATE ON FISH. (Über die Wirkung einer Mischung von Sulfobernsteinsäure-halbester und Olefinsulfonat auf Fische). Arch. FischWiss., 25(1/2): 53-56. In German.

The effect of a mixture of succinic acid mono-sulpho-ester and olefin sulfonate on golden ide (Leuciscus idus melanotus) and rainbow trout (Salmo gairdneri) was examined. In the case of golden ide the first losses occurred at 5 mg/l, with trout at 7.5 mg/l. These values were compared with the reduction in the surface tension of the corresponding concentrations. It was confirmed that a detrimental effect on fish is to be noticed at a reduction below 50 dyn/cm. The investigated product showed a good biodegradability. According to present investigations a detrimental effect on surface waters is not to be expected. (Authors)

18693. Coad, Brian W. (Dept. of Biol., Univ. of Ottawa, Ottawa, Ontario K1N 6N5, Canada). 1974. VERTEBRAL FREQUENCIES WITH NOTES ON ANOMALIES IN SAMPLES OF THREESPINE STICKLEBACKS (Gasterosteus aculeatus L.) FROM EASTERN NORTH AMERICA. Can. Field Nat., 88(2): 220-223.

18694. McLarney, W. O., D. G. Engstrom, and J. H. Todd (Woods Hole Oceanography Inst., Woods Hole, Massachusetts 02543). 1974. EFFECTS OF INCREASING TEMPERATURE ON SOCIAL BEHAVIOUR IN GROUPS OF YELLOW BULLHEADS (Ictalurus natalis). Environ. Pollut., 7(2): 111-119.

Groups of two yellow bullheads (Ictalurus natalis), a socially complex fish, were kept in 50-gallon aquaria and subjected to 1°C temperature increments every other day, over the range 24-33°C. Total activity, and with it the incidence of aggressive behaviour, increased with temperature over the entire range, with one notable exception. At about 30°C activity decreased to a level below that observed at the lowest temperature studied. The mode, as well as the frequency, of aggressive behaviour changed with temperature. Aggressive behaviour units were divided into two categories - display or warning units, which do not result in injury to either fish, and damaging units, which frequently do cause injury. Starting at 30°C, the relative frequency of damaging units became much greater. It is suggested that this change in behaviour is due to the loss of ability by yellow bullheads at high temperatures to distinguish individuals of their own species. A possible implication of this sort of phenomenon in natural ecosystems is discussed. (Authors)

18695. Hamilton, Sandra E. (NMFS, Great Lakes Fish. Lab., Ann Arbor, Michigan). 1974. A REVIEW OF THE LITERATURE ON THE USE OF TFM-BAYLUSCIDE IN FISHERIES. FWS/LR-74/03, 55 p., PB-235 442/1WJ, paper copy $3.75, microfiche $2.25.

Since 1956 the Great Lakes Fishery Commission has been responsible for formulating and implementing a program to eradicate or control the sea lamprey in the Great Lakes. The U. S. Fish and Wildlife Service and the Sea Lamprey Control Centre of the Canadian Department of the Environment act as agents for the Commission in sea lamprey control. In the search for a selective larvicide that would control lampreys without destroying fish and other aquatic organisms, about 6,000 chemicals were tested at the Hammond Bay Biological Station of the U. S. Fish and Wildlife Service, largely during the mid 1950's. One compound, TFM, which is selectively toxic to sea lampreys was developed for field use. In 1963 bayluscide was discovered to be extremely toxic to sea lampreys. Because bayluscide is also very toxic to fish, being virtually nonselective between lampreys and rainbow trout, only 3% by weight can be added to TFM without losing the selective toxicity of TFM.

18696. Ross, A. J., and Cathy A. Smith (U.S. Fish and Wildlife Serv., Western Fish Disease Lab., Seattle, Washington 98115). 1974. EFFECT OF TEMPERATURE ON SURVIVAL OF Aeromonas liquefaciens, Aeromonas salmonicida, Chondrococcus columnaris, AND Pseudomonas fluorescens. Prog. Fish-Cult., 36(1): 51-52.

18697. Duval, W. S., P. J. Brockington, M. S. von Melville, and G. H. Geen (Dept. of Biol. Sciences, Simon Fraser Univ., Burnaby, British Columbia V5A 1S6, Canada). 1974. SPECTROPHOTOMETRIC DETERMINATION OF DISSOLVED OXYGEN CONCENTRATION IN WATER. J. Fish. Res. Board Can., 31(9): 1529-1530.

A modification of the Winkler method which increases precision while decreasing time required for oxygen analysis is described. The technique involves colorimetric determination of liberated iodine concentration at 287.5 nm. (Authors)

18698. Hickman, Gary D., and James C. Congdon. 1974. EFFECTS OF LENGTH LIMITS ON THE FISH POPULATIONS OF FIVE NORTH MISSOURI LAKES. In: Symposium on overharvest and mgmt.of largemouth bass in small impoundments, N. C. Div. Amer. Fish. Soc., Spec. Pub. 3: 84-94.

The possibility of the overharvest of bass has become a reality in many small north Missouri lakes. Harvest rates of adult bass ranged from 27 to 69% during the first 4 days of fishing. An attempt was made to limit this overharvest by the utilization of various length limits on these lakes. The data evaluated here are the results of these length limits on the fish populations of five north Missouri lakes. Four of the lakes opened to fishing without a length limit. A 12-in minimum length limit was put into effect later as the fish populations began to deteriorate. The 12-in length limits did improve the fish populations of these four lakes. Larger numbers of bass were created which in turn reduced the numbers of small bluegill allowing for better bluegill growth. One lake was opened to fishing with a 15-in minimum length limit. The bass rapidly ran out of forage as the bluegill could not support the larger numbers of big bass. (Auth.)

18699. Gold, John R. (Fish. Biol. Res. Facility, Dept. of Animal Sci., Univ. of California, Davis, California 95616). 1974. A FAST AND EASY METHOD FOR CHROMOSOME KARYOTYPING IN ADULT TELEOSTS. Prog. Fish-Cult., 36(3): 169-171.

A method is described for obtaining large numbers of mitotic and meiotic metaphase chromosome spreads from adult teleosts which is less expensive than cell culture procedures and more efficient than tissue squash techniques. Resultant preparations are usually one-cell layer thick and provide good contrast and definition of chromosomes. To date, 90 individuals from two trout species (Salmo gairdneri and S. aguabonita) have been examined for chromosome karyotype using this method. The results indicate that large numbers of adult teleosts can be karyotyped both rapidly and inexpensively. (Auth.)

18700. Lothrop, David, and Bruce L. Nicholson (Dept. of Microbiol., Univ. of Maine, Orono, Maine 04473). 1974. INHIBITION OF CELLULAR DNA SYNTHESIS IN CELLS INFECTED WITH INFECTIOUS PANCREATIC NECROSIS VIRUS. J. Virol., 14(3): 485-492.

In asynchronous RTG-2 cell cultures infected with infectious pancreatic necrosis (IPN) virus, inhibition of cellular DNA synthesis, but not protein synthesis, was detected 5 to 6 h postinfection and was 80 to 90% complete by 7 to 8 h. Inhibition of DNA synthesis was largely abolished by UV irradiation of the virus. Sedimentation analyses of phenol-extracted DNA indicated that native cellular DNA was not degraded during infection. Sedimentation on alkaline sucrose gradients of DNA from cells pulsed with radioactive thymidine for varying periods indicated that elongation of nascent DNA chains proceeded normally in infected cells. These and previous results suggest that IPN virus infection results in a reduction of the number of chromosomal sites active in DNA synthesis but does not affect the rate of polymerization at active sites. Cells synchronized with excess thymidine and hydroxyurea and infected with virus at the time of release from the block demonstrated an inhibition of DNA synthesis 3 h postinfection. Cells infected 4 h prior to release continued to synthesize normal amounts of DNA for 1 to 2 h after release. These results indicated that DNA synthesis in early synthetic phase is relatively insensitive to inhibition by IPN virus. (Authors)

18701. Federova, G. V. (State Res. Inst. for Lake and River Fish. (GosNIORKh), Leningrad, USSR). 1973. CONCENTRATION AND ELIMINATION OF C^{14} BY FISHES IN RELATION TO SEX. J. Ichthyol., 13(3): 478-482.

18702. Rubec, P. J., and B. W. Coad (Dept. of Biol., Univ. of Ottawa, Ottawa, Ontario K1N 6N5, Canada). 1974. FIRST RECORD OF THE MARGINED MADTOM (Noturus insignis) FROM CANADA. J. Fish. Res. Board Can., 31(8): 1430-1431.

The margined madtom (Noturus insignis) is recorded for the first time in Canada, from a stream tributary to Lac Lapeche, Quebec (45°38.5'N, 76°12.2'W). Although its presence could be natural, it was probably introduced by the dumping of bait fish or the introduction of game fish. (Authors)

18703. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski (Environ. Science Program, Marist Coll., Poughkeepsie, New York). 1974. TOXICITY STUDY OF TWO OIL SPILL REAGENTS TOWARD HUDSON RIVER FISH SPECIES. Bull. Environ. Contamin. and Toxicol., 11(2): 159-162; Selected Water Resources Abstracts, 7(21): p. 56.

The median toxicity of No. 2 and No. 4 oils was determined in laboratory tests, as well as the effects of dispersants and collecting agents on this toxicity. Linear alkylate sulfonate (LAS) was the dispersant used and the collecting agent was Herder. Results showed that the dispersant is far more toxic for all species of fish tested than the oil, that the toxicity of oils increased in tanks containing sublethal amounts of LAS, and that Herder was both nontoxic and has little effect on the toxicity of oil to the species tested.

18704. Niimi, A. J. (Dept. of Biol., Univ. of Ottawa, Ottawa, Ontario K1N 6N5, Canada). 1974. RELATIONSHIP BETWEEN ASH CONTENT AND BODY WEIGHT IN LAMPREY (Petromyzon marinus), TROUT (Salmo gairdneri) AND BASS (Micropterus salmoides). Copeia, No. 3, pp. 794-795.

18705. Patterson, S., I. A. Johnston, and G. Goldspink (Muscle Res. Lab., Dept. of Zool., Univ. of Hull, Hull, Yorkshire, England). 1974. THE EFFECT OF STARVATION ON THE CHEMICAL COMPOSITION OF RED AND WHITE MUSCLES IN THE PLAICE (Pleuronectes platessa). Experientia, 30(8): 892-894.

The effect of experimental starvation on red and white muscles of the plaice, Pleuronectes platessa, was studied. In red as in white muscles a strong reduction of protein and glycogen was found, while the RNA- and DNA-content in both muscles was lowered. (Authors' summ.)

18706. Overholtz, William J. (U.S. Fish & Wildl. Serv., Ohio Coop. Fishery Unit, Ohio State Univ., Columbus, Ohio 43210). 1974. A METHOD FOR STOCKING TROUT IN THE HYPOLIMNION OF A LAKE. Prog. Fish-Cult., 36(3): 175-176.

A new method was used to stock 1,000 catchable rainbow trout (Salmo gairdneri) in Ottoville Quarry on August 8, 1973. The fish were flushed into the hypolimnion using a gasoline water pump and a length of plastic corrugated drain pipe. Survival was high and this procedure eliminated the possibility of the fish suffering thermal shocks during stocking. The trout were in excellent condition 2 months later and they were utilizing natural foods. (Auth.)

18707. McArdle, J. F., and R. J. Roberts (Unit of Aquatic Pathobiol., Univ. of Stirling, Stirling, Scotland). 1974. BILATERAL HYPERPLASIA OF THE THYMUS IN A RAINBOW TROUT (Salmo gairdneri). J. Fish. Res. Board Can., 31(9): 1537-1539.

Bilateral hyperplasia of the thymus is described in a 3-year-old male rainbow trout (Salmo gairdneri). Two large well-circumscribed lesions were noted in the dorsal gill chamber which consisted of lymphoid and epithelial elements. Structures resembling Hassal's corpuscles were also seen. (Authors)

18708. Schnick, Rosalie A. (U.S. Fish & Wildl. Serv., Fish Control Lab., La Crosse, Wisconsin). 1973. FORMALIN AS A THERAPEUTANT IN FISH CULTURE. FWS/LR-74/09, 175 p., PB-235 448/8WJ, paper copy $5.00, microfiche $2.25.

The critical review of the literature since 1909 on formalin covers the effectiveness, safety, wide usage, and need as a chemotherapeutant for fungus on fish eggs and external parasites of fish. The use of formalin as a therapeutant for fish had a rather slow start, but after prolonged treatments were developed in the early 1940's its use became widespread and universal. Formalin became even more effective when the indefinite prolonged treatment with a very low concentration was developed for ponds in 1957. Formalin is effective in concentrations from 1,000 to 2,000 microliter/liter for 15 minutes in controlling and preventing fungus on fish eggs. The most effective methods known of controlling and preventing external protozoa and monogenetic trematodes are treatments with formalin at 167 to 250 microliter/liter for one hour in tanks and raceways and 15 to 25 microliter/liter for an indefinite period in ponds and aquaria. Formalin retains a safety margin to fish of at least six times the recommended use levels. Portions of this document are not fully legible.

18709. Ellis, James E. (U.S. Fish & Wildl. Serv., Fish Farming Development Center, Rohwer, Arkansas 71666). 1974. OBSERVATIONS ON THE JUMPING AND ESCAPEMENT OF WHITE AMUR. Prog. Fish-Cult., 36(1): p. 15.

18710. Kruger, Andrzej, and Wanda Piotrowska (Inst. Rybactwa Srodladowego, Zaklad Gospodarki Stawowej, Zabieniec kolo Warszawy, Poland). 1974. THE EFFECT OF DEWATERING A POND IN FISH CATCHES UPON THE CONTENT OF BIOGENIC COMPONENTS IN THE BOTTOM OF IT. (Wplyw Spuszczania wody przy Odlowie Ryb na Zawartosc skladnikow biogennych w dnie Stawow). Roczniki Nauk Rolniczych, 96(1): 49-61. In Polish.

Preliminary report on the changes occurring in the composition of basic biogenic elements of a pond bottom in result of the total dewatering when hauling the fish in the autumn. The estimation of the content of biogenic elements washed up from a carp pond was made on the basis of analyses of the let off water and of the bottom soil prior to and after sluicing a pond. (Authors' synopsis).

18711. Litzbarski, H. (Pädagogische Hochschule Potsdam, Sektion Chemie/Biologie, GDR). 1974. THE INFLUENCE OF WATER TEMPERATURE ON THE BLOOD PICTURE OF THE CARP (Cyprinus carpio). [Der Einfluss der Wassertemperatur auf das Blutbild des Karpfens (Cyprinus carpio). Z. Binnenfischerei DDR, 21(9): 249-280. In German.

18712. Francis, Robert C. (Inter-Amer. Tropical Tuna Comm., Scripps Inst. of Oceanogr., La Jolla, California 92037). 1974. RELATIONSHIP OF FISHING MORTALITY TO NATURAL MORTALITY AT THE LEVEL OF MAXIMUM SUSTAINABLE YIELD UNDER THE LOGISTIC STOCK PRODUCTION MODEL. J. Fish. Res. Board Can., 31(9): 1539-1542.

The often-used approximation that, for a stock of fish under exploitation, the instantaneous fishing mortality rate equals the instantaneous natural mortality rate at the point of the maximum sustainable yield is examined with respect to its mathematical roots and practical utility. Examples from two diverse fisheries are utilized. (Auth.)

18713. Girsa, I. I. (A. N. Severtsov Inst. of Evolutionary Morphol. and Animal Ecol. (IEMEZh), USSR Acad. of Sciences, Moscow, USSR). 1973. ALTERATION IN THE BEHAVIOR AND VERTICAL DISTRIBUTION OF CERTAIN JUVENILE CYPRINIDS IN RELATION TO ILLUMINATION INTENSITY AND THE PRESENCE OF A PREDATOR. J. Ichthyol., 13(3): 449-454.

The study was based on sampling individual schools of juvenile bleak [Alburnus alburnus (L.)] in the Oka River at different hours of the day and night, observations of the behavior of these schools and the catching of juvenile bleak at night after attraction to the light of an electric lamp. Use has been made of experimental data on the distribution of juvenile roach [Rutilus rutilus (L.)], and of juvenile Leucaspius delineatus (Heck) and Scardinius erythrophthalmus (L.) in an aquarium at different hours of the day and night with the natural sequence of illumination. It has been established that at evening illumination of 0.1 lux the young depart from the surface of the water and disperse, the schools become mixed and the night is passed among vegetation. The presence of a predator in the aquarium produces a persistent defensive behavioral stereotype in the young which inhibited the attraction of the young to the light. The defensive behavior ceased 6-13 hours after removal of the predator.

18714. Hasse, John (Micronesian Mariculture Deomonstration Center, Koror, Palau, Western Caroline Islands 96940). 1974. UTILIZATION OF RABBITFISHES (SIGANIDAE) IN TROPICAL OYSTER CULTURE. Prog. Fish-Cult., 36(3): 160-162.

Rabbitfishes (Siganidae) were shown to keep aquaculture equipment free from fouling organisms, especially algae. They also increased the rate of oyster spat settlement on nylon net by their cleaning activities. Feeding was responsible for the clean equipment and the higher settlement rate. (Auth.)

18715. Dembinski, Wiktor, and Anna Korycka (Inst. Rybactwa Srodladowego w Olsztynie, Zaklad Techniki Rybackiej i Zaklad Hydrobiologii, Poland). 1974. WATER CONDUCTIVITY AND ELECTROFISHING. (Przewodnosc wlasciwa wody, a polowy elektryczne). Roczniki Nauk Rolniczych, 96(2): 75-87. In Polish.

On the basis of data from literature and the investigations performed by the authors, it was discussed the effect of water conductivity upon the parameters of electric field in which definite reactions originate in fish while catching. Also discussed was the dependence of fishing efficiency of electrofishing devices upon the conductivity of water. (Authors' synopsis)

18716. Nelson, Nancy C. (U.S. Fish & Wildl. Serv., Western Fish Disease Lab., Seattle, Washington). 1974. A REVIEW OF THE LITERATURE ON THE USE OF MALACHITE GREEN IN FISHERIES. FWS/LR-74/11, 88 p., PB-235 450/4WJ paper copy $4.00, microfiche $2.25.

Malachite green is used extensively in fish hatcheries as a fungicide on both eggs and fish, and is also effective against certain external protozoan and bacterial infections. It can be applied as an aqueous solution in tanks, troughs, raceways and ponds for fixed or extended treatment; used as a dip, or applied topically. At present, malachite green is not registered with the FDA for use on food fishes. Since it has been implicated as a mutagen, carcinogen and teratogen, safety will have to be demonstrated before registration is possible. This literature review was written as the first step in the drug clearance process.

18717. Parker, Richard A. (Departments of Zool. and Computer Sci., Wash. State Univ., Pullman, Washington 99163). 1974. EMPIRICAL FUNCTIONS RELATING METABOLIC PROCESSES IN AQUATIC SYSTEMS TO ENVIRONMENTAL VARIABLES. J. Fish. Res. Board Can., 31(9): 1550-1552.

Two empirical relationships were proposed to describe the metabolic consequences of high and low levels of light intensity, temperature, and nutrients in aquatic systems. Their performance was evaluated for three sets of data taken from the literature. (Auth.)

18718. Hughes, John T., Robert A. Shleser, and George Tchobanoglous (Mass. Div. of Mar. Fisheries, Vineyard Haven, Massachusetts 02568). 1974. A REARING TANK FOR LOBSTER LARVAE AND OTHER AQUATIC SPECIES. Prog. Fish-Cult., 36(3): 129-132.

Rearing lobster larvae to the 5th stage with survival rates exceeding 80% has been achieved using a specially designed rearing tank. Important operational characteristics are delineated and construction details are given. (Authors)

18719. Ovchinnikov, V. V., S. I. Gleyzer, and G. Z. Galaktionov (Atlantic Res. Inst. for Sea Fisheries and Oceanogr. (AtlantNIRO), Kaliningrad, USSR). 1973. FEATURES OF ORIENTATION OF THE EUROPEAN EEL [Anguilla anguilla (L.)] AT SOME STAGES OF MIGRATION. J. Ichthyol., 13(3): 455-463.

Data are given on features of the migration of juvenile and adult European eels. The effect of hydrophysical factors (current, depth, salinity and water temperature) on the orientation of eels during autumn migrations in the Kurskiy zaliv (Kurisches Haff) of the Baltic has been established by the remote observation method. Information is given concerning the seasonal dynamics of orientation and its connection with meteorological conditions. The behavior and orientation of eels in the early stages of ontogeny were investigated in a special aquarium - a labyrinth. Matters relating to the magnetic orientation of juvenile eels are discussed.

18720. Podoliak, Henry A. (U. S. Fish & Wildl. Serv., Tunison Lab. of Fish Nutrition, Cortland, New York). 1974. A REVIEW OF THE LITERATURE ON THE USE OF CALCIUM HYPOCHLORITE IN FISHERIES. FWS/LR-74/05, 286 p., PB-235 444/7WF, paper copy $6.75, microfiche $2.25.

One of the first, and still one of the most commonly used, sanitizers and disinfectants, chlorine's use spans nearly two centuries. The commercial availability of dry, packaged calcium hypochlorite as a high test, stable, and convenient chlorine source led to expanded usages of chlorine for water purification and for routine general sanitation in the food processing industry and allied animal husbandries. Calcium hypochlorite is still used for 'sterilization' of hatcheries or other fish holding facilities for eradication of infective diseases and is effective when the sterilization is performed in conjunction with proper cleansing and drying techniques. Disease prevention through routine sanitation of fisheries facilities requires a convenient sanitizer. Calcium hypochlorite, under the standards established for water works and for the food industry, safely disinfects fish hatcheries, fish farms, and fishery laboratories.

18721. Farabee, Gordon B. 1974. EFFECTS OF A 12-INCH LENGTH LIMIT ON LARGEMOUTH BASS AND BLUEGILL POPULATIONS IN TWO NORTHEAST MISSOURI LAKES. In: Symposium on overharvest and management of largemouth bass in small impoundments. N. C. Div. Amer. Fish. Soc., Spec. Pub. 3: 95-99.

Both Deer Ridge and Wakonda lakes have high numbers of slow growing bass. In 1965, 6% of the sampled bass in Deer Ridge were between 8.9 and 11.9 in long; in 1973, 60% were within this range. Wakonda is similar; in 1965, 11% were between 8.9 and 11.9 in; in 1973, 42% were within this range. This may suggest a buildup of bass numbers which could be attributed to the length limit. Larger bluegills are becoming common in Deer Ridge. Prior to the length limit establishment 7-in bluegills were scarce, but since its enforcement 7-in bluegills are becoming common. Wakonda had large numbers of bass present before a length limit was imposed and larger bluegills were present. Because of this, at Wakonda Lake, little effects of a length limit can be seen on the bluegills. (Auth.)

18722. Harms, U. (Isotopenlaboratorium der Bundesforschungsanstalt für Fischerei Hamburg, West Germany). 1974. DETERMINATION OF THE TRANSITION METALS MANGANESE, IRON, COBALT, COPPER AND ZINC IN RIVER FISHES WITH HELP OF X-RAY FLUORESCENCE ANALYSIS AND FLAMELESS ATOMIC ABSORPTION SPECTROSCOPY. (Bestimmung der Übergangsmetalle Mangan, Eisen, Kobalt, Kupfer und Zink in Flussfischen mit Hilfe der Röntgenfluoreszenzanalyse und der flammenlosen Atomabsorption). Arch FischWiss., 25(1/2): 63-74. In German.

With the intention of increasing our knowledge about the actual grade of heavy metal accumulation in river fish, the content of the transition metals manganese, iron, cobalt, copper and zinc was determined in various types of fishes from the river Elbe. In order to obtain the highest possible degree of reliability in the analytical values, we used both flameless atomic absorption spectroscopy and x-ray fluorescence analysis as independent methods of determination. In order to avoid errors in interpretation of the measured values, which can easily occur as a result of matrix effects, the analysis is based upon a selective separation and enrichment of the transition metals by chelate exchanger chromatography ("Chelex 100"). In element determination with help of the x-ray fluorescence analysis, the metal traces were enriched by complex precipitation using 1-[pyridyl-(2)-azo]-naphthol-(2) and transferred into an ideally measurable form. The analytical data obtained are shown in a diagram with double logarithmical scale. The content is shown on the x-axis, and the relative reproducibility (as variation coefficient) on the y-axis. (Auth.)

18723. Hoffman, G. L. 1973. XI. PARASITOLOGY. THE EFFECT OF CERTAIN PARASITES ON NORTH AMERICAN FRESHWATER FISHES. Internat. Verein. Limnol. 18: 1622-1627; Fish Health News, 3(4): p. 12.

18724. Coad, Brian W., Peter J. Rubec, and S. U. Qadri (Dept. of Biol., Univ. of Ottawa, Ottawa, Ontario K1N 6N5, Canada). 1974. DEFORMED VERTEBRAL COLUMNS IN THE BROWN BULLHEAD, Ictalurus nebulosus (Lesueur), FROM THE OTTAWA RIVER. Can. Field-Nat., 88(2): 224-226.

Deformed vertebral columns are reported for some specimens of the brown bullhead, Ictalurus nebulosus, from the Ottawa River at Ottawa-Hull. Deformities ranged from a simple vertebral column curvature to major fusions of centra. (Authors)

18725. Ivanchenko, O. F., and L. A. Ivanchenko (Zool. Inst., USSR Acad. of Sciences, Leningrad, USSR). 1973. THE USE OF ALCIAN BLUE TO STAIN THE CARTILAGINOUS SKELETON OF FISH LARVAE AND FINGERLINGS IN WHOLE MOUNTS. J. Ichthyol., 13(5): 794-796.

18726. Anderson, Ronald J. (Dept. of Fish. & Wildl. Biol., Colorado State Univ., Fort Collins, Colorado 80521). 1974. FEEDING ARTIFICIAL DIETS TO SMALLMOUTH BASS. Prog. Fish-Cult., 36(3): 145-151.

Artificial diets are the logical choice in developing a satisfactory method for feeding smallmouth bass; however, acceptance of artificial diets and cost of this feeding method were not known. Fingerling smallmouth bass were trained to accept Oregon moist pellet and Silver Cup Salmon artificial diets. Success in training ranged from 14.7 to 94.6%. Fish successfully trained were reared in ponds using the artificial diets. Retention of artificial diet feeding behavior during pond rearing ranged from 68.8 to 99.5%. Cost of training fingerling smallmouth bass to accept an artificial diet ranged from $0.013 to $0.097 per fish. In rearing ponds, supplemental conversion of the artificial diets ranged from 1.17 to 2.44. (Auth.)

18727. Martin, Robert A. 1974. SYMPOSIUM INTRODUCTION. In: Symposium on overharvest and management of largemouth bass in small impoundments. N. C. Div. Amer. Fish. Soc., Spec. Pub. 3: 4-5.

18728. Jackson, Gerry A. (U.S. Fish & Wildlife Serv., Southeastern Fish Cultural Lab., Marion, Alabama). 1974. A REVIEW OF THE LITERATURE ON THE USE OF COPPER SULFATE IN FISHERIES. FWS/LR-74/06, 95 p., PB-235 445/4WJ, paper copy $4.00, microfiche $2.25.

Copper sulfate is currently registered by the Environmental Protection Agency as an algicide and has been given a tolerance of 1.0 ppm in potable waters. This chemical is commonly employed for other aquatic purposes such as a therapeutant, piscicide and molluscicide and future clearance of copper sulfate for these applications is dependent on a thorough evaluation of its efficacy on target species and its toxicity to non-target organisms. In the past, failure to recognize variations in water quality, especially water hardness and alkalinity, has often resulted in undesirable consequences. When properly administered, however, with a full consideration of the various water quality parameters and biota present, copper sulfate is one of the most efficient and versatile chemicals available to the aquatic biologist.

18729. Park, Donn L., and Wesley J. Ebel (Northwest Fish. Center, NOAA, NMFS, Seattle, Washington). 1974. MARKING FISHES AND INVERTEBRATES. II. BRAND SIZE AND CONFIGURATION IN RELATION TO LONG-TERM RETENTION ON STEELHEAD TROUT AND CHINOOK SALMON. Marine Fish. Review, 36(7): 7-9; Fish Health News, 3(4): p. 17.

18730. Hare, G. M., and H. P. Murphy (Dept. of the Environ., Fish. and Mar. Service, Resource Development Branch, St. John's, Newfoundland, Canada). 1974. FIRST RECORD OF THE AMERICAN SHAD (Alosa sapidissima) FROM LABRADOR WATERS. J. Fish. Res. Board Can., 31(9): 1536-1537.

A single specimen of American shad (Alosa sapidissima) was captured in the Sand Hill River, southeastern coastal Labrador. The capture represented the first confirmed record of shad from Labrador and the most northerly record of this species. (Authors)

18731. Hattula, Marja Liisa (Dept. of Chem., Univ. of Jyväskylä, Jyväskylä, Finland). 1974. SIMULTANEOUS CLEAN UP OF FISH FAT CONTAINING LOW LEVELS OF RESIDUES AND SEPARATION OF PCB FROM CHLORINATED PESTICIDES BY THIN-LAYER CHROMATOGRAPHY. Bull. Environ. Contamin. Toxicol., 12(3): 331-337.

18732. Johnson, David L., and Richard O. Anderson. 1974. EVALUATION OF A 12-INCH LENGTH LIMIT ON LARGEMOUTH BASS IN PHILIPS LAKE, 1966-1973. In: Symposium on overharvest and management of largemouth bass in small impoundments. N.C. Div. Amer. Fish. Soc., Spec. Pub. 3: 106-113.

Philips Lake is a 37-A private impoundment in Boone County, Missouri. Experimental regulations for this lake have included a 12-in length limit on largemouth bass (Micropterus salmoides), an 18-in length limit on channel catfish (Ictalurus punctatus), and a daily family bag limit of five bass and channel catfish either singly or in combination. Channel catfish have been stocked annually. Other important species in the lake include bluegills (Lepomis macrochirus), and gizzard shad (Dorosoma cepedianum). Sample data indicate a stockpiling of protected-size adult bass with slow growth from 1966 to 1971; of bass 8-in total length and larger, 81 to 95% were less than 12 in. Low relative abundance of forage-size fishes most years suggests intensive predation. Restrictive harvest regulations on bass, and other management measures, appear to have contributed to high catch rates of sublegal bass, few large bass, sustained yields of 6- to 8-in bluegill and 1.5 pound and larger channel catfish. A better quality of bass fishing may be achieved from a population in which 50-60% of bass 8 in or longer exceed 12 in. A regulation that protects bass 12 to 15 in long is proposed to accomplish this objective. (Authors)

18733. Boyd, John (Biol. Sci. Section, Space Sci. Lab., Northrop Services, Inc., P. O. Box 34416, Houston, Texas 77034). 1974. A SIMPLE, RAPID METHOD FOR COLLECTING PAN HATCHED BRINE SHRIMP. Prog. Fish-Cult., 36(3): p. 57.

18734. Johnson, W. Waynon, and Arnold M. Julin (U.S. Fish & Wildlife Service, Fish-Pesticide Res. Lab., Columbia, Missouri). 1974. A REVIEW OF THE LITERATURE ON THE USE OF DIURON IN FISHERIES. FWS/LR-74/07, 103 p. PB-235 446/2WJ, paper copy $4.50, microfiche $2.25.

Diuron is one of five major phenylurea herbicides produced by E. I. duPont de Nemours and Company. It was introduced as an experimental compound in 1951, registered for industrial weed control in 1953 under the trade name 'Karmex', and for agricultural use in 1954. Although a federal label for the aquatic use of diuron has not been registered, it has been extensively studied and variously used for this purpose. Presently, it is registered for aquatic weed control in three states and at least four foreign countries. Diuron shows good potential as a broad-spectrum, aquatic herbicide. It will control most algal species and many vascular hydrophytes. It is persistent in the aquatic environment and evidence indicates that low levels of accumulation may occur in non-target organisms. Although exhibiting relatively low, acute toxicity, recent studies indicate that chronic effects may be significant.

18735. Dawson, Verdel K., and Leif L. Marking (U.S. Fish & Wildl. Service, Fish Control Lab., La Crosse, Wisconsin 54601). 1974. REMOVAL AND DE-ACTIVATION OF ANTIMYCIN USING CARBON AND CHLORINE. Prog. Fish-Cult., 36(1): p. 19.

18736. Lavrova, Ye. A., and Yu. V. Natochin (Lab. for Res. on Development of the Excretary Function, I. M. Sechenov Inst. of Evolutionary Physiol. and Biochem., USSR Acad. of Sciences, Leningrad, USSR). 1973. CATION CONCENTRATION IN THE BLOOD OF SOME BAIKAL FISHES AND THE ION-REGULATING FUNCTION OF THE KIDNEY. J. Ichthyol., 13(5): 764-769.

Research on cation concentration in the blood serum of 13 species of fishes of Lake Baikal, belonging to 9 families, has shown that there are definite differences between fishes of different families. The lowest sodium concentration (90 - 95 meq/liter) is characteristic of cyprinids; a comparatively low potassium concentration in the blood serum is also noted in these fishes. Calcium and magnesium contents fluctuate considerably. Descriptions are given of the characteristics of the processing of cations in the kidney tubules, and also of the reaction of the kidneys in injection of magnesium chloride solution. The kidneys of marine and diadromous fishes secrete magnesium intensively; the kidneys of Baikal fishes (irrespective of their origin) did not secrete magnesium after injection or did not alter the level of its excretion.

18737. Nagel, Tim O. (Dept. of Natural Resources, Div. of Wildlife, London Fish Hatchery, London, Ohio 43140). 1974. REARING OF WALLEYE FINGERLINGS IN AN INTENSIVE CULTURE USING OREGON MOIST PELLETS AS AN ARTIFICIAL DIET. Prog. Fish-Cult., 36(1): p. 59.

18738. Opuszynski, Karol (Inst. Rybactwa Srodladowego, Zaklad Gospodarki Stawowej, Zabieniec kolo Warszawy, Poland). 1974. SELECTED TEMPERATURES OF WHITEFISH, Coregonus clupeaformis (Mitchill), IN THE VERTICAL GRADIENT TANK. Roczniki Nauk Rolniczych, 96(1): 63-72. In English.

Preferred temperature of whitefish fingerlings 4.2-7.2 g in weight was found to be near 10°C. The result was probably lowered by the fish's tendency to keep near the bottom of the apparatus. Selected temperature of another sample of younger and smaller whitefish (1.1-1.7 g) was found to be 17°C. There was an influence of the position of thermal gradient within the tank on the selected temperature. (Auth.'s synopsis)

18739. Dmitriyeva, Ye. N. (A. N. Severtsov Inst. of Evolutionary Morphol. and Animal Ecol. (IEMEZh), Moscow, USSR). 1973. SPAWNING GROUNDS OF COMMON PIKE-PERCH [Lucioperca lucioperca (L.)] AND VOLGA PIKE-PERCH [Lucioperca volgensis (Gmelin)] IN THE URAL RIVER. J. Ichthyol., 13(5): 784-787.

18740. McCoy, R. H., and K. S. Pilcher (Dept. of Microbiol., Oregon State Univ., Corvallis, Oregon 97331). 1974. PEPTONE BEEF EXTRACT GLYCOGEN AGAR, A SELECTIVE AND DIFFERENTIAL Aeromonas MEDIUM. J. Fish. Res. Board Can., 31(9): 1553-1555.

Studies directed toward the formulation of a selective/differential pour plate medium for Aeromonas species resulted in the following composition (in grams per liter): Bacto-peptone, 10; Bacto-beef extract, 10; glycogen, 4; NaCl, 5; sodium lauryl sulfate, 0.1; bromthymol blue, 0.1; agar, 15. The pH of the medium after autoclaving was 6.9-7.1. After the agar had gelled and the surface had dried, plates were overlaid with 2% nonnutrient agar in distilled water. Aeromonas colonies were recognized by their characteristic size and yellow color in this medium. It has been used to monitor the concentrations of A. hydrophila and A. salmonicida in hatchery waters, to recover these organisms from the intestines and lesions of experimentally infected fish, to isolate A. hydrophila from fish mucus and pet turtles, and to determine aeromonad survival times in water. (Authors)

18741. Alekperov, A. P. (Azerbaydzhanian Dept., Central Sturgeon Fish. Res. Inst., Baku, USSR). 1973. POSSIBLE USE OF SEVRYUGA [Acipenser stellatus (Pallas)] SPAWNERS FROM SEA CATCHES BY FISH HATCHERIES. J. Ichthyol., 13(5): 787-790.

18742. Hackney, P. A. 1974. LARGEMOUTH BASS HARVEST IN THE MIDWEST, AN OVERVIEW. In: Symposium on overharvest and management of largemouth bass in small impoundments. N.C. Div. Amer. Fish. Soc., Spec. Pub. 3: 114-116.

The papers in the symposium are reviewed and evaluated in terms of their contribution to the solution of the management problem presented by the disruption of the predator-prey relation resulting from excessive harvest of the predator species, largemouth bass. Techniques must be devised which will allow retention of a bass population of sufficient density to restrict prey abundance and maximize the quantity and quality of the harvest. It seems unlikely that closed seasons will effectively regulate rates of exploitation or recruitment unless the closed period coincides with the period of greatest vulnerability to the fishermen. A biologically effective creel limit would be 1/3 to 1/6 bass per fisherman. The success of a minimum size limit is dependent upon the hope that growth rate will not be seriously retarded and natural mortality will be unchanged and this hope probably will not be fully realized. Nevertheless, the use of size limits to regulate harvests appear promising and they need critical evaluation.

18743. Dorr, John A., III (Great Lakes Res. Div., Univ. of Mich., Ann Arbor, Michigan 48104). 1974. CONSTRUCTION OF AN INEXPENSIVE LIGHTED SORTING CHAMBER. Prog. Fish-Cult., 36(1): 63-64.

18744. Sills, Joe B. (U. S. Fish & Wildl. Serv., Southeastern Fish Control Lab., Warm Springs, Georgia). 1974. A REVIEW OF THE LITERATURE ON THE USE OF LIME ($Ca(OH)_2$, CaO, $CaCO_3$) IN FISHERIES. FWS/LR-74/10, 32 p., PB-235 449/6WJ, paper copy $3.25, microfiche $2.25.

Liming is a means of pond care which serves many purposes. Generally it protects the health of fishes and improves pond productivity by producing favorable biological conditions. Suitably applied lime does the following: It kills by caustic action freely swimming and bottom dwelling organisms that are harmful to fish. Liming raises the low pH of acid waters to a slightly alkaline value (7 to 8) which is more favorable to fish health and the metabolic cycle of the pond. Liming increases the alkaline reserve in water and mud, and by its buffering action prevents extreme changes in pH. It also creates a carbon dioxide reserve and insures sufficient calcium for plant and animal nutrition. Liming aids soil and mineral decomposition and the release of nutrients. Liming the water precipitates suspended and soluble organic matter which demand oxygen and provide favorable conditions for the existence of many disease instigators.

18745. Rucker, Robert R., and Paul M. Kangas (U.S. Fish and Wildlife Service, Western Fish Disease Lab., Seattle, Washington 98115). 1974. EFFECT OF NITROGEN SUPERSATURATED WATER ON COHO AND CHINOOK SALMON. Prog. Fish-Cult., 36(3): 152-156.

Experiments were designed to determine the effects of supersaturated water on the eggs and fry of coho salmon (Oncorhynchus kisutch) and chinook salmon (O. tshawytscha). The results indicated that air or nitrogen supersaturated waters up to 128% saturation do no harm to chinook or coho salmon eggs. Also, it appears safe to rear the fry about a week in waters containing up to 128% N_2 + Ar before losses due to gas bubble disease develop. (Authors)

18746. Zaika, V. Ye., and N. A. Ostrovskaya (Inst. of the Biol. of the Southern Seas, Ukrainian Acad. of Sciences (Inbyum), Sevastopol, USSR). 1973. INDICATORS OF THE AVAILABILITY OF FOOD TO FISH LARVAE. J. Ichthyol., 13(5): 791-793.

18747. Funk, John L., and George G. Fleener (Missouri Dept. of Conservation, 1110 College Ave., Columbia, Missouri 65201). 1974. THE FISHERY OF A MISSOURI OZARK STREAM, BIG PINEY RIVER, AND THE EFFECTS OF STOCKING FINGERLING SMALLMOUTH BASS. Trans. Amer. Fish. Soc. 4: 757-771.

Over 92,000 marked fingerling smallmouth bass were stocked in Big Piney River, 1952-1955. An estimated 63,600 smallmouth bass were caught between 1953, when the first stocked fish entered the creel, and 1958 when no more marked fish were caught. Of that number, not more than 2,100 were stocked fish. This is a little more than 3% of all the bass caught and a little more than 2% return of stocked fish. Seventy species of fish were collected between 1951 and 1958 with electric shockers, hoopnets, and seines. Golden redhorse, rock bass, black redhorse, northern hog sucker, smallmouth bass and longear sunfish made up 80% of the total weight. The Ozark minnow, bleeding shiner, northern studfish, stoneroller, and bluntnose minnow were the most important forage species. This species composition is representative of Ozark headwater streams. Mean annual catch rates ranged from 35.2 to 134.9 kg/10 shocker hr of which 2.3 to 13.6 kg/10 shocker hr was bass. Big Piney River is subject to flash floods with crests up to 6 m above base level. A drought which caused cessation of flooding permitted a record year-class of smallmouth bass to be produced in 1952. This large year-class contributed substantially to the fishery but complicated interpretation of the stocking data. Fishing pressure measured by a creel census varied from 130 to 275 hr/ha per yr. Annual yield of fish ranged from 9.0 to 29.8 kg/ha of which 2.1 to 6.0 kg/ha were smallmouth bass. Each year longear sunfish, rock bass, green sunfish, and smallmouth bass made up about 90% of the catch. Less than 5% of the smallmouth bass caught were more than 5 years old. Virtual populations of smallmouth bass varied from 560 (1950) to 24,600 (1952) fish. There appeared to be a direct correlation between the number of young bass surviving the first summer and the number of fish the year-class contributed to the creel. Big Piney River yielded a greater quantity of fish to the fisherman than most other warmwater streams, many trout streams, and some warmwater lakes and reservoirs. The quality of the fishery declined under continued fishing pressure of over 250 hr/ha per yr.

18748. Mel'nichuk, G. L. (Inst. of Hydrobiol., Ukrainian Acad. of Sciences, Kiev, USSR). 1973. QUANTITIVE EVALUATION OF THE FEEDING OF JUVENILE PIKE-PERCH [Lucioperca lucioperca (L.)] IN KREMENCHUG RESERVOIR. J. Ichthyol., 13(3): 471-474.

Experiments in which juvenile pike-perch were reared in containers at different specific food concentrations have confirmed the correctness of calculations of the daily rations by the energy balance method. These experiments have enabled us to establish the optimum and maximum specific food concentrations for juvenile pike-perch, which are 1.2-1.4 and 1.7-1.8 g · juvenile^{-1} · day^{-1}. The equation expressing the relationship between the size of the ration and the body weight of the fish ($R = 0.296\ W^{0.72}$) may be used to calculate the rations when the weight range of juvenile pike-perch is large. (Conclusions)

18749. Avtalion, R. R., Annette Gorlin, Evelyn Gutwirth, and A. Wojdani (Dept. of Life Sciences, Bar Ilan Univ., Ramat Gan, Israel). 1974. DETERMINATION OF BLOOD VOLUME IN FISH. A NEW METHOD. Bamidgeh, 26(1): 16-20.

A new method for the evaluation of blood volume which is especially suitable for aquatic animals is described here. This method is based on red blood cell dilution which occurs in vivo after bleeding quantities of blood varying from 20 to 50% of the presumed blood volume. The remaining blood volume and the remaining quantity of red blood cells express a relationship similar to that obtained by the initial blood volumes of a group of carp were calculated. The obtained values (5.28 ml./100 gr. body weight) for blood volume using this method were compared with those obtained in other groups of carp tested by two known blood volume quantitation methods. (Evans blue, 5.30 ml./100 gr. B.w., I^{131}HSA, 5.25 ml./100 gr. B.w.). (Authors)

18750. Nelson, Nancy C. (U. S. Fish and Wildlife Serv., Western Fish Disease Lab., Seattle, Washington). 1974. A REVIEW OF THE LITERATURE ON THE USE OF BETADINE IN FISHERIES. FWS/LR-74/04, 50 p., PB-235 443/9WJ, paper copy $3.25, microfiche $2.25.

Many bacterial and viral fish diseases can be transmitted on eggs from carrier brood fish. In 1969, betadine (providone-iodine), a non-selective organic iodine germicide, was found to be an effective egg surface disinfectant. This literature review was written to support FDA registration for betadine solution on food fish eggs. It is virucidal and bactericidal to common fish pathogens at levels which are non-toxic to salmonid eggs. The effectiveness and safety of betadine solution make it a likely candidate for successful registration.

18751. Hoffman, Glenn L., and Charles J. Byrne (U.S. Fish and Wildlife Serv., Eastern Fish Disease Lab., Kearneysville, West Virginia 25430). 1974. FISH AGE AS RELATED TO SUSCEPTIBILITY TO Myxosoma cerebralis, CAUSE OF WHIRLING DISEASE. Prog. Fish-Cult., 36(3): p. 151.

18752. Wojno, Tadeusz, and Barbara Rast (Akademia Rolniczo-Techniczna w Olsztynie, Wydzial Ochrony Wod i Rbyactwa Srodladowego, Poland). 1974. THE EFFECT OF FAMISHING THE RAINBOW TROUT (Salmo gairdneri Richardson, 1836) FRY UPON THE GROWTH AND SURVIVAL IN THE SECOND YEAR OF CULTURE. (Wplyw Glodowania Narybku Pstraga Teczowego (Salmo gairdneri Richardson, 1836) na Wzrost i Przezywalnosc w Drugim Roku Wychowu). Roczniki Nauk Rolniczych, 96(1): 95-102. In Polish.

Trials determined the effect of famishing the rainbow trout fry upon the growth, the utilization of food and the survival rate. The fry unfed during the winter and spring characterized with a higher rate of growth, a better utilization of food and with similar survival rate as compared with the fry fed.

18753. Magomedov, S. K., V. I. Chernyshov, and I. A. Shekhanova (Dept. of Biophysics, Moscow Univ., Moscow, USSR). 1973. THE PART PLAYED BY AUTOGENOUS ANTIOXIDANTS IN THE ADAPTION OF FISHES TO DIFFERENT SALINITIES. J. Ichthyol., 13(3): 474-478.

The response of fish at the level of alteration in antioxidizing activity to the effect of different salinities is made up of three periods: rapid alteration of AOA, stabilization at a level different from the control and slight rise before death. Antioxidizing potentialities are limited to structural antioxidants under the influence of lethal salinities, whereas in adaptation to permissible changes of the osmotic pressure of the environment they are made up of a minimum of two components: structural and synthesized in the liver in sufficient quantity. The antioxidizing system has an important role to play in the adaptation of fish to changes in the osmotic conditions of the environment. (Conclusions)

18754. Vincent, Richard (Fish. Div., Montana Dept. of Fish and Game, Bozeman, Montana 59715). 1974. ADDENDUM TO RIVER ELECTROFISHING AND FISH POPULATION ESTIMATES. Prog. Fish-Cult., 36(3): p. 182.

18755. Armstrong, James G. (U.S. Fish and Wildlife Service, Fish-Pesticide Res. Lab., Denver, Colorado). 1974. A REVIEW OF THE LITERATURE ON THE USE OF ENDOTHALL IN FISHERIES. FWS/LR-74/08, 23 p., PB-235 447/0WJ, paper copy $3.00, microfiche $2.25.

Endothall is an organic contact herbicide and algicide used in lakes and ponds. It is used on terrestrial seed crops as a pre-harvest desiccant and is registered for use as a pre- and post-emergent herbicide. It is registered for use in lakes and ponds as a herbicide and algicide. It is of value to those concerned with a fishery because it does not persist in the environment and the levels required to control aquatic vegetation do not seem to be harmful to either fishes or fish-food organisms. It is relatively safe to the applicator and economical.

18756. Boaze, John L., and Robert T. Lackey (U. S. Fish and Wildlife Service, Norris, Tennessee 37828). 1974. AGE, GROWTH, AND UTILIZATION OF LANDLOCKED ALEWIVES IN CLAYTOR LAKE VIRGINIA. Prog. Fish-Cult., 36(3): 163-164.

About 110,000 landlocked alewives (Alosa pseudoharengus) were introduced into Claytor Lake, Va., in 1968 and 1969 by personnel of the Virginia Commission of Game and Inland Fisheries in an effort to establish a more satisfactory forage fish population. Scales from 244 alewives taken in 1971 were used to determine initial age and growth information. Sampled alewives ranged from 1 to 3 years old, with age class 1 being most abundant. The presence of age class 0 alewives in 1971 indicated establishment of a reproducing alewife population in Claytor Lake. Alewives were found in stomachs of walleye, white bass, smallmouth bass, channel catfish, flathead catfish, black crappie, white crappie, and yellow perch. Walleye and white bass utilized alewives extensively. (Authors)

18757. Reinhold, H. (Zweigstelle des Fischgesundheitsdienstes Potsdam, GDR). 1974. STUDY OF THE CONTROL OF BRANCHIOMYCOSIS WITH GRICIN IN A TROUT INSTALLATION OF THE PEOPLE'S FRESHWATER FISHERY POTSDAM IN 1973. (Bekampfungsversuch der Branchiomycose mit Gricin in einer Forellenanlage des VEB Binnenfischerei Potsdam im Jahre 1973). Z. Binnenfischerei DDR, 21(9): 270-272.

18758. Strasdine, G. A., and Lyn Dubetz (Dept. of the Environ., Fisheries and Marine Serv., Vancouver Lab., Vancouver, British Columbia, Canada). 1974. COLIFORM FLORA OF MIGRATING SOCKEYE SALMON (Oncorhynchus nerka). J. Fish. Res. Board Can., 31(9): 1559-1560.

The coliform flora of migrating sockeye salmon (Oncorhynchus nerka) was examined at two marine and one freshwater location. Enterobacter species accounted for approximately 50% of all isolates; the remaining isolates were divided almost equally between Citrobacter and Klebsiella types. (Authors)

18759. Funk, John L. (editor), and Richard O. Anderson (organizer). 1974. SYMPOSIUM ON OVERHARVEST AND MANAGEMENT OF LARGEMOUTH BASS IN SMALL IMPOUNDMENTS. N.C. Div. Amer. Fish. Soc., Spec. Pub. 3, 116 pp.

A collection of 13 papers, including an introduction and a summary, dealing with the overharvest of largemouth bass in Midwestern impoundments of less than 500 acres and management efforts to alleviate the situation. Most of these papers were originally presented at the 34th Midwest Fish and Wildlife Conference, Des Moines, Iowa, 1972, in a symposium entitled "Largemouth bass overharvest - fact or fiction".

18760. Toetz, Dale W. (Dept. of Zool., Oklahoma State Univ., Stillwater, Oklahoma 74074). 1974. UPTAKE AND TRANSLOCATION OF AMMONIA BY FRESHWATER HYDROPHYTES. Ecology, 55: 199-201.

The roots of two species of freshwater hydrophytes are capable of absorbing $^{15}NH_4$ and translocating labeled N to apical tissues under laboratory conditions. (Auth.)

18761. Turner, Spencer E., Gordon W. Proctor, and Robert L. Parker (Missouri Dept. of Conservation, Jefferson City, Missouri 65101). 1974. RAPID MARKING OF RAINBOW TROUT. Prog. Fish-Cult., 36(3): 172-174.

A rapid method of marking rainbow trout (Salmo gairdneri) utilizing cold brands and an easily constructed marking table, is described. Four branders successfully marked 2,000 trout per hour or 12,000 to 16,000 trout per day. (Authors)

18762. Szlauer, Lech (Akademia Rolnicza w Szczecinie, Zaklad Hydrozoologii, Poland). 1974. THE USE OF ZOOPLANKTON OUTFLOWING FROM LAKES AS FOOD FOR YOUNG Coregonus lavaretus (Linnaeus, 1758). [Wykorzystanie do Karmienia Narybku Siei - Coregonus lavaretus (Linnaeus, 1758) Zooplanktonu, Wynoszonego z Jezior Przez Okplywy]. Roczniki Nauk Rolniczych, 96(2): 89-107, in Polish.

Zooplankton carried out of lakes by rivers was used to feed young Coregonus lavaretus during the early spring. A feeding selectivity with respect to the largest plankton forms and, concurrently, a reluctance to eat Rotatoria and nauplius stages, were evident throughout the experiments. (Synopsis)

18763. Nelson, Nancy C. (U.S. Fish and Wildlife Service, Western Fish Disease Lab., Seattle, Washington). 1974. A REVIEW OF THE LITERATURE ON THE USE OF FORMALIN-MALACHITE GREEN IN FISHERIES. FWS/LR-74/12, 33 p., PB-235 451/2WJ, paper copy $3.25, microfiche $2.25.

This paper was written to support initiation of FDA registration procedures for use of the formalin-malachite green mixture as a therapeutant in fish culture. This mixture of chemicals is used to treat external parasites, particularly Ichthyophthirius, of coldwater and warmwater fishes. It is a very effective medicament with a lower toxicity than that of either chemical used individually, but additional data on toxicity to non-target organisms will probably have to be gathered before registration can be obtained.

18764. Kuz'mina, V. V., and L. P. Zhilina (Inst. of the Biol. of Inland Waters, USSR Acad. of Sciences, Borok, Yaroslavl Province, USSR). 1973. THE RATIO OF GLYCOGEN CONCENTRATIONS IN THE LIVER AND MUSCLES OF SOME FRESHWATER TELEOST FISHES. J. Ichthyol., 13(4): 623-627.

18765. Contreras-B, Salvador, and Raul Rivera-T. 1973. Notropis aguirrepequenoi, A NEW SPECIES ENDEMIC TO RIO SOTO LA MARINA, TAMAULIPAS, MEXICO (PISCES: CYPRINIDAE). [Notropis aguirrepequenoi, Especie Neuva Endemica del Rio Soto La Marina, Tamaulipas, Mexico (Pisces: Cyprinidae)]. Publicaciones Biologicas Instituto de Investigaciones Cientificas, Monterrey, N.L. Mexico, 1(2): 24 p. In Spanish.

Notropis aguirrepequenoi sp. nv. from the Rio Soto la Marina, state of Tamaulipas, Northeastern Mexico, is described as new, from 705 specimens collected at 4 localities, from the middle reaches and the headwaters of a cooler tributary. The new form belongs to the braytoni species group of the cyprinid genus Notropis, characterized by the presence of an oblique subterminal mouth, convex snout, black lateral stripe, triangular basicaudal spot, pharyngeal teeth 4-4, and frequently a small barbel at the corner of the mouth; it is easily recognized by the unique combination of the following characters: lateral line modally 36, predorsals 14 to 16, anal rays 8, pectorals 14 to 15, pharyngeal teeth 4-4 and no barbels. Its closest relatives seem to be N. braytoni from the Rio Grande, and Notropis sp. from Rio Panuco, both with pharyngeal teeth 1.4-4.1. Tables of morphometric and meristic variation, comparison with other members of the group, and a distributional map complete the treatment of the new form. The trivial name is derived from Dr. Eduardo Aguirre Pequeno, to honor this distinguished scientist from Nuevo Leon, Mexico. (Authors' summ.)

18766. Orme, Leo E., and Carol A. Lemm (U.S. Fish & Wildl. Serv., Diet Testing Development Center, Spearfish Fisheries Center, Spearfish, South Dakota 57783). 1974. TROUT EYE EXAMINATION PROCEDURE. Prog. Fish-Cult., 36(3): 165-168, illus.

18767. Evans, Wallace A. (Dept. of Zool., Brigham Young Univ., Provo, Utah 84601). 1974. GROWTH, MORTALITY, AND HEMATOLOGY OF CUTTHROAT TROUT EXPERIMENTALLY INFECTED WITH THE BLOOD FLUKE Sanguinicola klamathensis. J. Wildl. Dis., 10(4): 341-346.

Studies were made of the growth, mortality, and blood changes of cutthroat trout (Salmo clarki) experimentally infected with the blood fluke, Sanguinicola klamathensis Wales 1958. Five hundred non-infected cutthroat trout fingerlings and 500 exposed to a population of 6000 Fluminicola fusca snails with a 6% prevalence of infection with the blood fluke S. klamathensis were maintained for several months. Following 3 months exposure to the blood fluke infection, the experimental group had 80% mortality. Packed cell volumes and oxyhemoglobin levels were reduced significantly in the experimental fish as compared to the controls. Control fish continued to grow logarithmically in total weight, while the experimental fish declined in total weight due to parasitism and mortality. There were significant differences between the two groups for the average weight per fish and the average length per fish during the period of mortality. (Auth.)

18768. Ellis, James E. (U. S. Fish & Wildl. Serv., Fish Farming Experiment Sta., Stuttgart, Arkansas). 1974. A REVIEW OF THE LITERATURE ON THE USE OF MASOTEN IN FISHERIES. FWS/LR-74/13, 65 p., PB-235 452/0WJ, paper copy $3.75, microfiche $2.25.

Trichlorfon (Dylox, Dipterex, Neguvon, etc.) is the common name of the active ingredient in Masoten (R). It is an organic phosphate parasiticide originated by Bayer AG in Germany and developed by Chemagro in the United States. Its first use in fisheries was to control ectoparasites. It was recently registered under the trade name Masoten (EPA Reg. No. 11556-38 and 11556-39) for use in impounded waters (aquariums and ponds) for fish not used as food (goldfish and bait fish). It is an effective therapeutant for the control of anchorworms Lernaea sp., fish lice Argulus sp. and gill flukes Cleidodiscus sp., Dactylogyrus sp., and Gyrodactylus sp. In Europe it is approved for use on the same target organisms including treatment of food fish such as carp, eel, and trout.

18769. Zakharchenko, G. M. (Pechora-Ilych Reservation, Siberian Fish Industry Research, Planning and Design Inst., Tyumen, USSR). 1973. MIGRATIONS OF THE GRAYLING [Thymallus thymallus (L.)] IN THE UPPER REACHES OF THE PECHORA. J. Ichthyol., 13(4): 628-629.

18770. Kilgen, Ronald H. (Dept. of Biol. Sciences, Nicholls State Univ., Thibodaux, Louisiana 70301). 1974. ARTIFICIAL SPAWNING AND HATCHING TECHNIQUES FOR BLACKTAIL REDHORSE. Prog. Fish-Cult., 36(3): p. 174.

Artificial spawning and hatching techniques for blacktail redhorse (Moxostoma poecilurum) are presented. Hatching occurred at 8 days, swim-up stage at 12 days, and fry fed on yeast at 16 days. Optimum temperature was 20°C. (Auth.)

18771. Bengtsson, B. E. (Dept. of Biol., Section of Ecological Zool., Univ. of Umeå, Sweden). 1974. VERTEBRAL DAMAGE TO MINNOWS Phoxinus phoxinus EXPOSED TO ZINC. Oikos, 25(2): 134-139.

Adult minnows Phoxinus phoxinus L. exposed to different concentrations of $Zn(NO_3)_2$ in fresh water, developed haemorrhages and lesions. Vertebral damage occurred between 0.20 and 2.4 ppm Zn^{2+} which is below the 96-hr LC_{50} dosage (3.2 ppm). The striking similarity between the symptomology of zinc and organophosphates is discussed. (Auth.)

18772. Cochran, J. O., and W. H. Babcock (Colo. Dept. of Natural Resources, Div. of Wildlife, Fish. Res. Center, Fort Collins, Colorado 80521). 1974. A DEVICE FOR MAINTAINING CONSTANT OXYGEN CONCENTRATION IN FLOWING WATER. Prog. Fish-Cult., 36(3): 177-178.

18773. Duncan, Thomas O. (U.S. Fish & Wildlife Service, South Central Reservoir Investigations, Fayetteville, Arkansas). 1974. A REVIEW OF LITERATURE ON THE USE OF POTASSIUM PERMANGANATE (KMnO4) IN FISHERIES. FWS/LR-74/14, 62 p., PB-235 453/8WJ, paper copy $3.75, microfiche $2.25.

Potassium permanganate is one of the most widely used inorganic chemicals in the world. Since its first use in fish culture in 1893, potassium permanganate has been used primarily as: A disinfectant in fish hatcheries for aquatic plants, aquaria, raceways, ponds, and water supplies; for removal of fish parasites; to reduce disease, or as a disease preventative, especially on wounds of fish; for detoxification of fish toxicants such as rotenone, and antimycin; for fungus and algae control; and temporary oxygen depletion problems in ponds. In foreign countries, potassium permanganate is used for removal of parasites before the live fish is sent to market, as well as a disinfectant. Portions of this document are not fully legible.

18774. Parsons, David S., and Jack W. Tatum (Sabine River Authority of Texas, Orange, Texas 77630). 1974. NEW SHALLOW WATER MULTIPLE-PLATE SAMPLER. Prog. Fish-Cult., 36(3): 179-180.

The construction and use of a new multiple-plate artificial substrate sampler is described. Each sampler consists of ten 3-in. (7.6-cm) diameter hardboard disks assembled on a 6-in. (15.2-cm) section of threaded steel rod. Quantitative macroinvertebrate data were successfully collected in shallow-water stream and reservoir areas by utilizing a 3-hole brick as a base for the multiple-plate sampler. The 4.5 lb (2.04 kg) brick-based sampling unit provides approximately 1 ft^2 (0.09 m^2) of surface area for colonization and costs less than $0.80 to construct. (Authors)

18775. Szlauer, L. (Akademia Rolnicza w Szczecinie, Zaklad Hydrozoologii, Poland). 1974. ELECTRIC LIGHT FISHING OF YOUNG Coregonus lavaretus (Linnaeus, 1758), AND Coregonus albula (Linnaeus, 1758). [Polow na Swiatlo Elektryczne Narybku Siei - Coregonus lavaretus (Linnaeus, 1758) i Sielawy - Coregonus albula (Linnaeus, 1758). Roczniki Nauk Rolniczych, 96(2): 109-121. In Polish.

The paper presents a method, designed by the author, of catching young coregonid fish in ponds by means of electric light as a bait. The method consists in a trap and a conical net being used at the same time. Bright light (a 1000 W lamp) is used to lure the fish and weak light gathers them in the direct vicinity of the trap inlet. The fish were caught at the weak light. They were driven into the trap and caught by means of the net. The method enables young fish to be caught even in heavily grown ponds and even by a single man. (Synopsis)

18776. Schnick, Rosalie A. (U.S. Fish & Wildlife Service, Fish Control Lab., La Crosse, Wisconsin). 1974. A REVIEW OF THE LITERATURE ON THE USE OF ROTENONE IN FISHERIES. FWS/LR-74/15, 131 p., PB-235 454/6WJ, paper copy $4.75, microfiche $2.25.

Rotenone has been used for 40 years as a piscicide in the United States and Canada. It is effective in low concentrations (0.05 to 2 mg/l of the commercial formulations) against most life stages of many species of freshwater and marine fishes, but with a range of specificity among species. Other desirable characteristics of rotenone include less persistence in water than organochlorine pesticides, low toxicity to birds and mammals, and rapid toxicity to fish. If needed, it can be detoxified easily by potassium permanganate or chlorine and removed by activated carbon. The activity of rotenone is limited by high pH, hardness, alkalinity, and low temperatures. Twenty degradation products have been observed after rotenone was exposed to light; this observation may pose a problem in the tolerance registration of rotenone.

18777. Hestand, R. S., and B. E. May (Florida Game and Fresh Water Fish Comm., Fisheries Res. Lab., Eustis, Florida 32726). 1972. EFFECTS OF A DIQUAT PLUS CUTRINE COMBINATION ON INVERTEBRATES IN INGLIS RESERVOIR. Reprint: Hyacinth Control Journal, Vol. 10, pp. 40-43.

18778. Hoey, Jack W., and Lee C. Redmond. 1974. EVALUATION OF OPENING BINDER LAKE WITH A LENGTH LIMIT FOR BASS. In: Symposium on overharvest and management of largemouth bass in small impoundments. N. C. Div. Amer. Fish. Soc., Spec. Pub. 3: 100-105.

This 150-A lake was stocked with several forage fishes and a reduced number of bass fingerlings. Adult bass spawned in the lake providing an additional size group of bass. This stocking manipulation provided for fast growth and a wide size range of bass so that an effective size limit could be established on the bass to reduce initial harvest yet provide for bass to continually reach "legal" size. The lake was opened to fishing September 21, 1968 with a minimum length limit of 14 in. for bass. A quantitative daytime creel census was conducted through October, 1968 and April through October 15, 1969. By the end of October, 1968, 20 lb/A of bass had been removed at a fishing pressure of 63 hr/A. In 1969, at a fishing pressure of 500 hr/A, fishermen removed 61 lb of legal-size bass per acre. Over 19,000 bass were caught and released, providing additional fishing thrills. Rate of catch in 1969 (with released bass) was 2.65 fish/trip. The second creel census was conducted May 1 through October 31, 1973. Fishermen caught fish at a rate of 5.7 fish/trip and applied a fishing pressure of 280 hr/A. Bluegills dominated the catch, comprising 85% of the total number of fish harvested. An estimated 10 bass 14 in. and over were harvested per acre. Only 11% of the bass caught were creeled. Growth of fish continues to be good although some buildup of bass under 14 in. is occurring. The structure of the bass population is better than in lakes without a length limit. There is a good size distribution of bluegills. Bluegills average about 6.5 in. in 3 yr; bass now appear to be entering the creel in their fourth and fifth year of life. (Authors)

18779. Mauck, Wilbur L. (U.S. Fish and Wildlife Service, Fish Control Lab., La Crosse, Wisconsin). 1974. A REVIEW OF THE LITERATURE ON THE USE OF SIMAZINE IN FISHERIES. FWS/LR-74/16, 62 p., PB-235 455/3WJ, paper copy $3.75, microfiche $2.25.

Simazine is a systemic herbicide that has been registered and used for many years for weed control in crops and industrial areas. In recent years, the use of simazine as an aquatic herbicide has been extensively investigated regarding its effects on the pond environment. Simazine was found to be efficaceous, to have relatively low toxicity to aquatic fauna, and to be residual, but it did not accumulate in non-target organisms. Most of the required information for simazine registration as an aquatic herbicide has been completed. Additional data for registration is needed in the areas of fish and water tolerances. (Modified author abstract).

18780. Greenland, Donald C., and Jesse David Bryan (U.S. Fish and Wildlife Service, Fish Farming Development Center, Rohwer, Arkansas 71666). 1974. ANCHOR TAG LOSS IN CHANNEL CATFISH. Prog. Fish-Cult., 36(3): 181-182.

Two groups of channel catfish (Ictalurus punctatus) were tagged with Floy FD-67 and FD-67F anchor tags and held for 12 weeks to ascertain tag loss. Ninety percent of the FD-67 and 19% of the FD-67F tags were not suitable markers for identifying individual channel catfish for long-term studies. (Authors)

18781. Crowley, Gerald J. (U.S. Fish and Wildlife Service, Western Fish Nutrition Lab., Cook, Washington). 1974. A REVIEW OF THE LITERATURE ON THE USE OF SQUOXIN IN FISHERIES. FWS/LR-74/17, 29 p., PB-235 456/1WJ, paper copy $3.25, microfiche $2.25.

The piscicide Squoxin is highly selective against two species of squawfish, Ptychocheilus oregonensis and P. umpqua. Extensive field testing in Idaho and Oregon has demonstrated the effectiveness of the chemical in controlling squawfish while not harming sympatric fish species, especially salmonids, and invertebrates. The use of Squoxin as an invention to promote fish culture by squawfish population eradication has been patented in the United States and Canada. The compound is not yet registered. However, efforts toward this end are underway as part of the Squoxin Development Project. Collaborators in this project are presently compiling available information for application to Environmental Protection Agency, anticipated in early 1974.

18782. Bugbee, Stephen L., Thomas F. Lorenz, and Leotis Mosby (Surveillance and Analysis Div., U.S. Environ. Protection Agency, 25 Funston Road, Kansas City, Kansas 66115). 1974. BOTTLE RACK FOR PRIMARY PRODUCTIVITY STUDIES. Prog. Fish-Cult., 36(3): p. 183.

Intensive primary productivity studies on large midwestern reservoirs required the use of sturdy bottle racks easily assembled and disassembled for overnight storage. An inexpensive plexiglass bottle rack mounted on metal conduit was developed and proved trouble free after extensive use. (Authors)

18783. Schultz, Donald P., and Paul D. Harman (U.S. Fish and Wildlife Service, Southeastern Fish Control Lab., Warm Springs, Georgia). 1974. A REVIEW OF THE LITERATURE ON THE USE OF 2,4-D IN FISHERIES. FWS/LR-74/18, 94 p., PB-235 457/9WJ, paper copy $4.00, microfiche $2.25.

The herbicide 2,4-D (2,4-(dichlorophenoxy) acetic acid) was adapted from terrestrial to aquatic use. Recommended treatment rates vary from 2.24 kg/ha or even higher for submersed species. Many formulations of 2,4-D are available, but the one used most commonly is the dimethylamine salt of 2,4-D (DMA-2,4-D). The ester formulations are also used but are 10 to 20 times as toxic to fish and other aquatic organisms as the dimethylamine salt. A tolerance of 0.1 mg/liter has been issued for DMA-2,4-D that occurs in potable water as a result of applications of DMA-2,4-D to ditch banks in the western United States. Several Federal agencies are presently pursuing the registration of 2,4-D for use on irrigation canal banks and for use in moving water. Portions of this document are not fully legible.

18784. Pillai, Appu K., Arthur I. Salhanick, and Charles Terner (Dept. of Biol., Biological Sci. Center, Boston Univ., Boston, Massachusetts 02215). 1974. STUDIES OF METABOLISM IN EMBRYONIC DEVELOPMENT. V. BIOSYNTHESIS OF CORTICOSTEROIDS BY TROUT EMBRYOS. Gen. Comp. Endocrin., 24(2): 152-161.

Endogenous cortisol and cortisone were isolated from embryonated trout eggs. Homogenates prepared from isolated embryos converted ^{14}C-labelled progesterone to cortisol and cortisone. Although endogenous aldosterone could not be identified, [1,2-^{3}H] corticosterone was converted to aldosterone and 18-hydroxycorticosterone. The addition of cortisol (10^{-7} M) to washed isolated trout embryos at the eyed-up stage resulted in induction of tyrosine aminotransferase. (Authors)

18785. Borthwick, Patrick W. (U. S. Environ. Protection Agency, Gulf Breeze, Florida 32561). 1974. A CLINICAL CENTRIFUGE TUBE FOR SMALL BLOOD SAMPLES. Prog. Fish-Cult., 36(3): 184.

A simple apparatus for separating small amounts of blood is described. A centrifuge tube is adapted to serve as a holder for a small-bore sample tube made from a Pasteur capillary pipet. This low-cost device gives distinct component separation in small blood samples using a clinical centrifuge. (Auth.)

18786. Hestand, R. S., B. E. May, D. P. Schultz, and C. R. Walker (Florida Game and Fresh Water Fish Comm., Fish. Res. Lab., Eustis, Florida 32726). 1973. ECOLOGICAL IMPLICATIONS OF WATER LEVELS ON PLANT GROWTH IN A SHALLOW WATER RESERVOIR. Reprint: Hyacinth Control Journal, Vol. 11, pp. 54-58.

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